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VICTORIA.

DEPARTMENT OF MINES

RECORDS

OF THE

GEOLOGICAL SURVEY OF VICTORIA

(E. J. DUNN, F.G.S., Director).

Vol. II., Part 4.

ISSUED BY

W. DICKSON, SECRETARY FOR MINES, UNDER THE AUTHORITY
OF THE HON. D. McLEOD, M.P., MINISTER OF MINES.

By Authority:
J. KEMP, GOVERNMENT PRINTER, MELBOURNE.

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CONTENTS.

PAGE

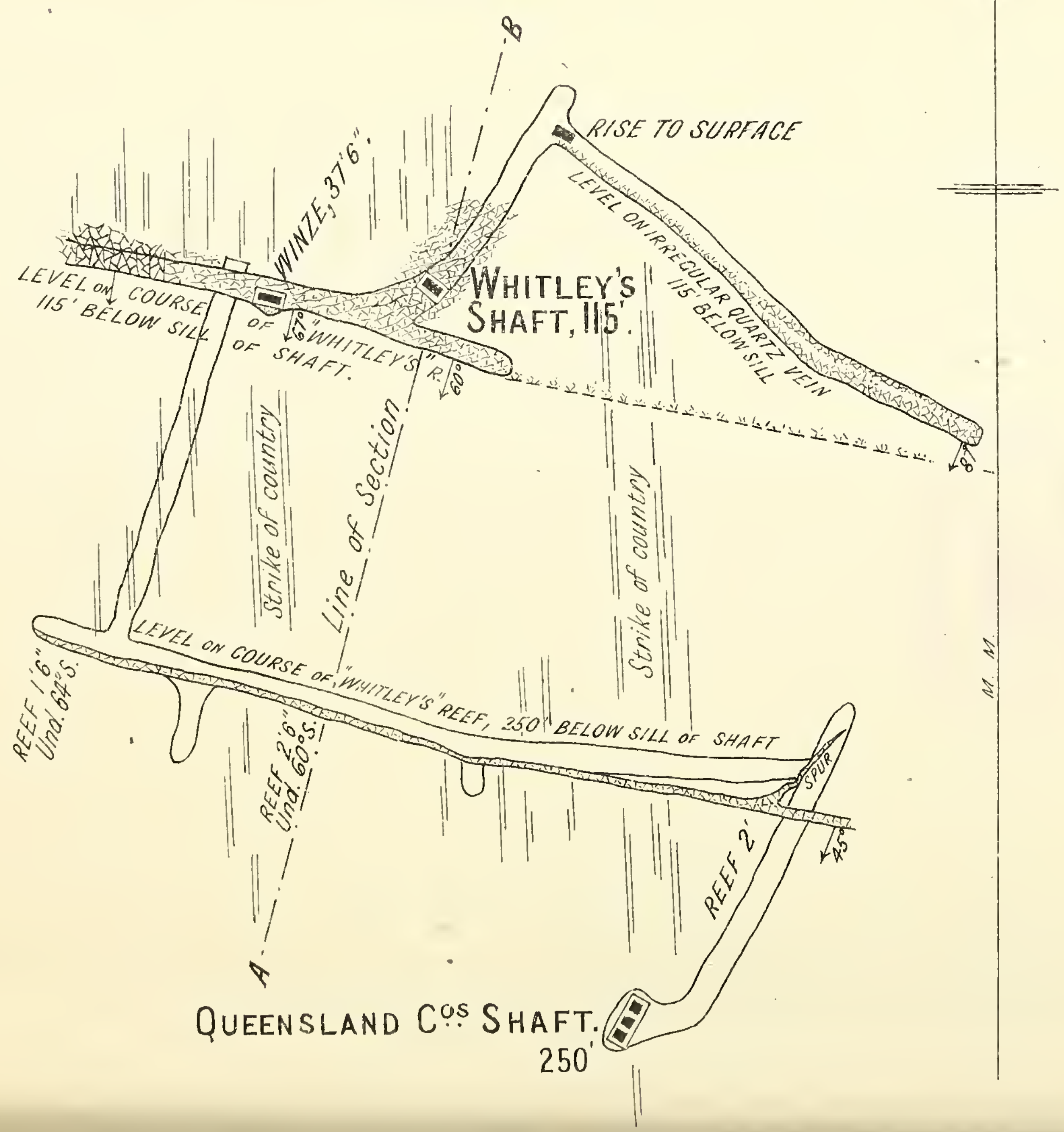
The Queensland Quartz-Crushing and Cyanide Company's Mine, St. Arnaud. H. S Whitelaw 133
Some Mines at Wedderburn. O. A. L. Whitelaw 134
The La Mascotte Mine, Wedderburn. O. A. L. Whitelaw 135
Burke's Flat and Wehla. E. J. Dunn 137
Report on a New Rush at Moliagul. W. H. Ferguson 140
The New Rush at Patchy Flat, near Dunolly. W. H. Ferguson 141
The Wareek Alluvial Rush, near Maryborough. A. M. Howitt 143
The Maryborough Leviathan Gold Mines Limited. A. M. Howitt 144
Kirk's Reef, Maryborough. E. J. Dunn 146
The Cockatoo Flat Rush, Parish of Tchirree. Stanley Hunter 147
The Byron Reef, Newstead. E. J. Dunn 147
The Meteor Mine, Newtown, near Scarsdale. John Easton 148
Star of the East Mine, Berringa. John Easton 150
Boring Sites, Mounts Buninyong and Warrenheip. W. Baragwanath ... 151
The Daylesford Gold Mine. W. Baragwanath 152
Mulrooney's Lease, Jubilee Lake Company, Daylesford. E. J. Dunn ... 153
The Ajax Mine, Daylesford. E. J. Dunn 153
The Plan of the Anticlines at Bendigo. E. J. Dunn 154
The Norfolk Reef, Kangaroo Flat. H. S. Whitelaw 155
The Occurrence of Quartz Spurs in Wattle Gully, Chewton. E. J. Dunn ... 157
The Golden Top Mine, Bullengarook, County of Bourke. Stanley Hunter ... 157
The Copper Lode, Mt. Camel, near Heathcote. E. J. Dunn 160
Cunningham's Antimony Lode, Tyaak, Broadford. A. M. Howitt 161
Further Notes on Antimony Ore at Tyaak. Stanley Hunter 166
Orthoclase Felspar and Cassiterite in the Parish of Tallangallook, County of Delatite. A. M. Howitt 167
Report on Alleged Discovery of Phosphate of Alumina near the Great Rand Mine, Howqua River, County of Wonnangatta. A. M. Howitt 169
The Edi Turquoise Field, King River. E. J. Dunn... 170
Some Mines at Chiltern. W. Baragwanath 174
Clarke's New Find, Fulton's Creek. W. Baragwanath 177
The Crinoline Exended Mine, Donnelly's Creek. W. Baragwanath ... 178
Geological Boundaries in the Tyers River District. J. Easton 179
Notes on the Foster Gold-field. W. H. Ferguson 180
Pioneer Mine, Bright. E. J. Dunn 181
The Trident Mine, Stackey Gully, Bright. J. P. L. Kenny 182
The Reform Reef, Myrtleford. E. J. Dunn 183
The Lord of the Hills Reef, Growler's Creek, Wandiligong. E. J. Dunn ... 184
The Oriental Reef, Wandiligong. E. J. Dunn 185
The Oriental Mine, Wandiligong. J. P. L. Kenny 186
The New Moon Reef, Wandiligong. J. P. L. Kenny 188
The Gapstead Gold-field, near Palmerston. E. J. Dunn 190
The Cedric and Sadie Leases, Wandiligong. J. P. L. Kenny 191
Rose, Thistle, and Shamrock Mine, Harrietville. J. P. L. Kenny 192
The Buckeye Mine, near Harrietville. J. P. L. Kenny 194
Basalt along the Gibbo River. R. A. F. Murray 195
Black Coal Horizons in Victoria. E. J. Dunn 197
Geological Boundaries in the Woori Yallock Basin. J. Easton 198
Boundaries of Formations between the Head of the Acheron and Yea Rivers and the Yarra. J. Easton 199
Diamond Drill Boring in search of Saddle Reefs. E. J. Dunn 200
Report on the Mineral Resources of East Gippsland. E. J. Dunn 201
Obsidian Buttons. E. J. Dunn 202
Reports on Fossils. Fredk. Chapman, A.L.S., F.R.M.S. (National Museum) ... 207
Report on Jurassic Plants. Fredk. Chapman, A.L.S., &c. 212
Reports on Graptolites. T. S. Hall, M.A. (Melbourne University) 221

BRITISH MUSEUM
P. D.
NATURAL HISTORY

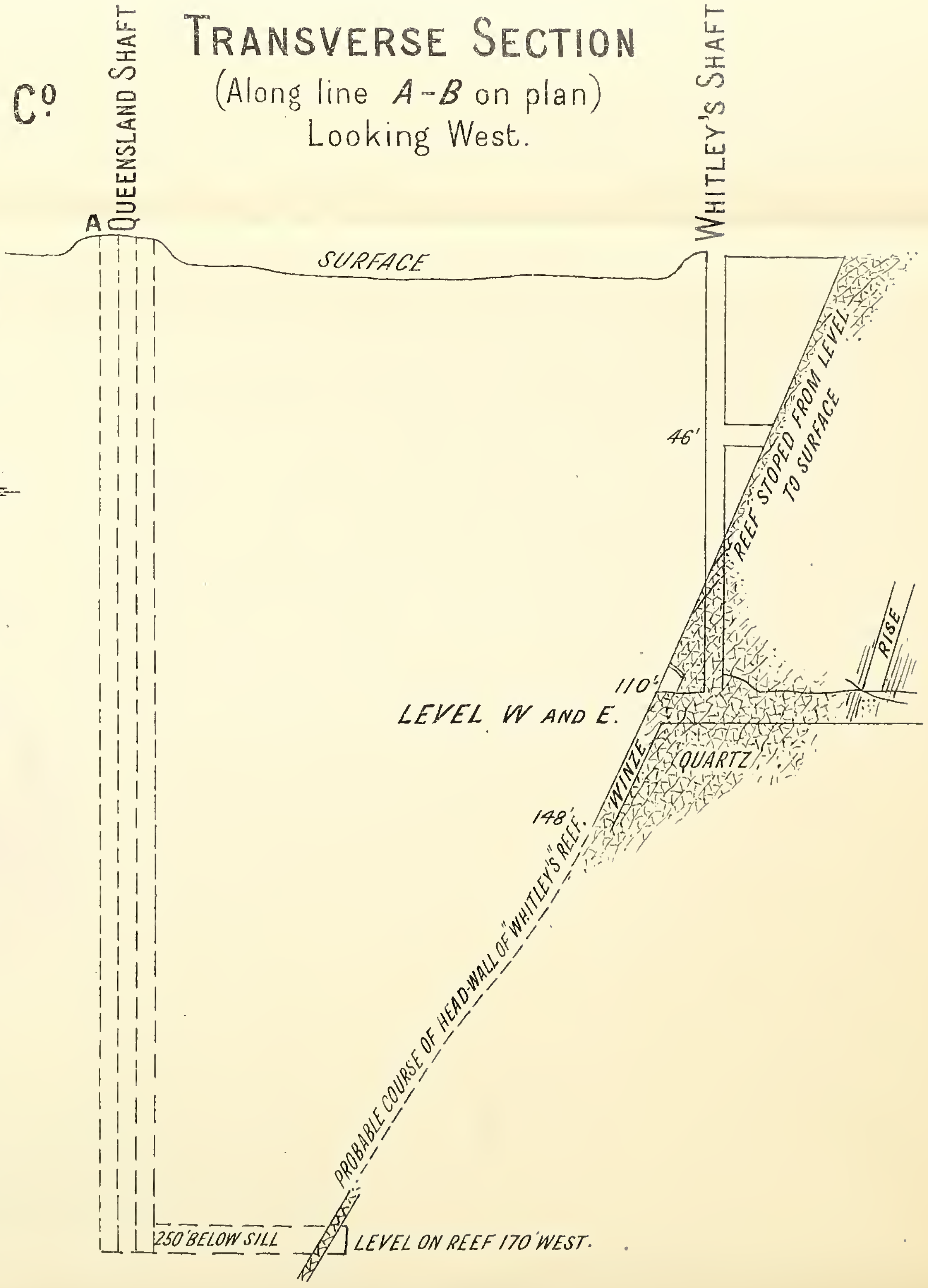
UNDERGROUND SURVEY OF MINES,
ST ARNAUD.
THE QUEENSLAND QUARTZ-CRUSHING AND CYANIDE CO

Scale — 60 feet to 1 inch.

PLAN



TRANSVERSE SECTION
(Along line A–B on plan)
Looking West.



THE QUEENSLAND QUARTZ-CRUSHING AND CYANIDE COMPANY'S MINE, ST. ARNAUD.

By H. S. Whitelaw.

The reef worked from the main shaft of the Queensland Quartz-Crushing and Cyanide Company is probably a continuation of that worked from the old shaft 160 feet to the north-west, and known as Whitley's Reef. This being so, it is evident that the cross-cut being driven south will be useless for prospecting purposes. As soon as I recognised this, I informed the mine manager, Mr. McRostie, in order to prevent unnecessary waste of money which might be spent to advantage in other parts of the mine—for instance, in sinking a winze on the reef at a point at about 120 feet west from the crosscut from the main shaft, where the reef is from 2 ft. 6in. to 3 ft. wide, and the best gold was seen in driving. This point is almost directly under where the richest stone was worked in Whitley's claim, and is situated in a bed of greenish-coloured slate, striking nearly at right angles to the reef. This slate in outward appearance closely resembles the olive-green variety referred to in my report on the St. Arnaud gold-field as the "ore-carrier" of the field, and which in several reefs has undoubtedly influenced the deposition of gold in the quartz intersecting it.

Whitley's reef is a "cross" reef formed in a fault which strikes across the "country" in a nearly east and westerly direction. The main reef-channel varies in width between 1 foot and 3 feet, and underlies to the south at between 45 deg. and 70 deg. from the horizontal. The head-wall is generally firm and clean, and occasionally slickensided; the foot-wall is often broken by spurs and masses of subcrystalline quartz "making" from the north, and which, in places in the old workings, attain a thickness of over 30 feet (see section). It is the occurrence of these large bodies of quartz that has led the present holders of the mine to believe that the comparatively small reef in the lower workings is not connected with that in the upper workings. However, a close examination of the reef shows that the stone on the wall in the upper workings is very similar to that between the walls at the lower level, while the large body outside the walls has a different appearance—is not so "close." I am inclined to the opinion that the two bodies are not of the same age.

There is a disposition on the part of the shareholders to spend a certain amount of money in searching for and prospecting the larger body at the 250ft. level. The information gained during the survey all points to the probability of that body dying out between the upper and lower levels. But even if it exists, as the manager thinks, I know of no reason for assuming that it will prove payable. Where cut in Whitley's workings, it was poor, and is still standing. Moreover, the "country" in the direction indicated is for some distance thick-bedded sandstone, in which, my experience teaches me, the St. Arnaud "cross" reefs are generally poor. There would, therefore, seem a better chance of success in prospecting the smaller but better defined reef by sinking as above suggested.

[*Report sent in 24.2.02.*]

SOME MINES AT WEDDERBURN.

By O. A. L. Whitelaw.

Lane's Reef.

Lane's reef is situated about three quarters of a mile north-east of the township of Wedderburn. It was one of the first reefs discovered in that district, the prospector being Mr. Zeb. Lane, late manager of the Lord Nelson mine at St. Arnaud. Golden stone was found lying on the surface, the first ton taken from the outcrop yielding 73 oz. 4 dwts. of gold. The mining claims at this period did not exceed 48 feet, many being smaller; from these many remarkable yields were obtained, the ground held by Mr. T. W. Cosh returning up to 90 ozs. per ton. After the exhaustion of the rich upper zone by the claimholders the ground was taken up by a Ballarat syndicate, who sank an engine shaft to a depth of 180 feet; a crushing taken out by this company from the 80-ft. level yielded only 1½ dwts. per ton, and the ground was abandoned without further prospecting. Since then the ground has been held continuously, but very little prospecting undertaken.

Lane's reef varies in width from 1 foot to 5 or 6 feet, but the gold is not evenly distributed through the stone, as a rule only 6 or 12 inches of the footwall being broken, although in cases, judging by the stopes, it has paid to break the reef from wall to wall. The length of the auriferous shoot varied from 100 to 150 feet, and has been worked on a pitch to the north at 1 in 1 for 300 feet.

Above water level (110 feet) the reef has been stoped right back to the surface, but below very little work or prospecting has been done. The workings being full of water, I was unable to examine them personally; but am informed that at the bottom level (180 feet) practically no work has been done, while at the only other level (144 feet) very little prospecting was done, and the greater portion of the work consisted of breaking out the hanging wall stone, which was left by the early miners as unpayable. At both of these levels a cross-cut put out east would intersect the reef at a point which is under the shoot of gold. It would be necessary in both cases to drive north to cut the gold worked above.

On account of the rich returns, attention has always been concentrated upon Lane's reef, to the exclusion of other lines of reef closely adjoining it. At least five well-defined reefs occur within a distance of 320 feet of the engine shaft. These are practically unprospected even at the surface, although of promising appearance, and auriferous at other points outside Lane's ground. Two of these (Scotch Jack's and Gardiner's reefs) gave returns of over an ounce per ton.

Baker's Reef.

Baker's reef, which is 35 feet west of Lane's reef, was only discovered a few years back by the present holders of the ground. Since then it has been worked from a shaft 50 feet deep for an average return of 1 ounce per ton. This reef varies from 6 to 15 inches in thickness, and dips west at 70 degrees; gold may be obtained in both faces of the 50 foot level.

While working this reef a flat vein up to 6 inches thick was struck; this vein crosses the country, and apparently connects Baker's and Lane's reefs, and dips to the north at 1 in 1. The junction of this flat reef with Lane's reef closely corresponds with the base of the shoot of gold in Lane's reef. Payable gold was obtained on this reef from the 50 foot level to the surface, and gold may still be seen in the stone as it dips underfoot.

Both of Baker's reefs must have been intersected by the engine shaft, but were apparently disregarded.

At 30 feet and 300 feet respectively, west of Lane's reef, centre country is well developed. The relation of the quartz bodies to these folds should be carefully observed.

My examination of this ground convinces me that if a vigorous policy of prospecting be undertaken it will result profitably.

The western lines of reefs should be intersected by cross-cut above water level, and Lane's line of reef thoroughly explored at a depth.

Little Wonder.

The main workings of this mine are situated south of, and on the line of strike of Lane's reef. The whip shaft is 1,870 feet south of Lane's engine shaft. The reef worked is considered an extension of Lane's line. The average width of reef varies from 6 inches to 12 inches, and the shoot of gold to 90 feet in length. The highest recorded crushing is 50 ozs. from 10 tons, while much of the stone returned 2 ozs. per ton. The lowest workings in this mine are at 100 feet. At present there is a depth of 50 feet of water in the workings, so that I was unable to make a very full examination. The pitch of the gold shoot appears to be to the north. No cross-cut was extended west from the whipshaft to cut Gardiner's and the other lines of reef worked in Lane's ground.

Cosh's Reef.

This reef lies to the south of the Little Wonder, or Lane's reef, and about two chains west; it corresponds to Gardiner's reef in Lane's ground.

Payable gold has been obtained on the surface for a length of 100 feet. All the workings are shallow, consisting of numerous shafts to a depth of 20 or 30 feet; these disclose a rather spurry formation, reaching to a thickness of 10 feet. Selected stone has returned up to 2 ozs. per ton. This ground is, or was, until recently, being worked by Mr. T. W. Cosh with payable results.

[*Report sent in 2.2.06.*]

THE LA MASCOTTE MINE, WEDDERBURN.

By O. A. L. Whitelaw.

The La Mascotte Mine is situated 3 miles 10 chains due north-east of the Wedderburn Post Office, and is one of the most easterly lines of auriferous reef discovered in the belt.

The original discoverer was Mr. Tom Martin who traced a run of alluvial gold up the side of the hill from a part of Hunter's Gully now known as Klondyke. The auriferous outcrop was found near the cap of the spur at the source of the surface gold. This was about the year 1896. Martin sank a shaft on the reef to a depth of 9 feet, and is reported to have obtained several ounces of gold by dollying. In consequence of a slight break in the reef it was abandoned, but late in the year 1898, was reprospected by Messrs. George Leech and Victor Shirkey, who almost immediately got on to payable gold. The prospectors sank an underlie shaft on the reef, payable gold continuing for about 16 or 18 feet and reaching a maximum length of 13 feet. The main body of reef ranged between 2 ft. 6 in. and 3 ft. 6 in., but the auriferous portion did not exceed 8 inches, and averaged about 4 inches. In all 12 tons of stone were crushed for a yield of 30 ozs. 19 grs. of gold, in addition to which 5 ozs. 2 dwts. 9 grs. were obtained by dollying specimens, giving a total return of 35 ozs. 3 dwts. 4 grs. of gold. A few tons of "seconds" at present lying on the surface are considered worth about half-an-ounce per ton.

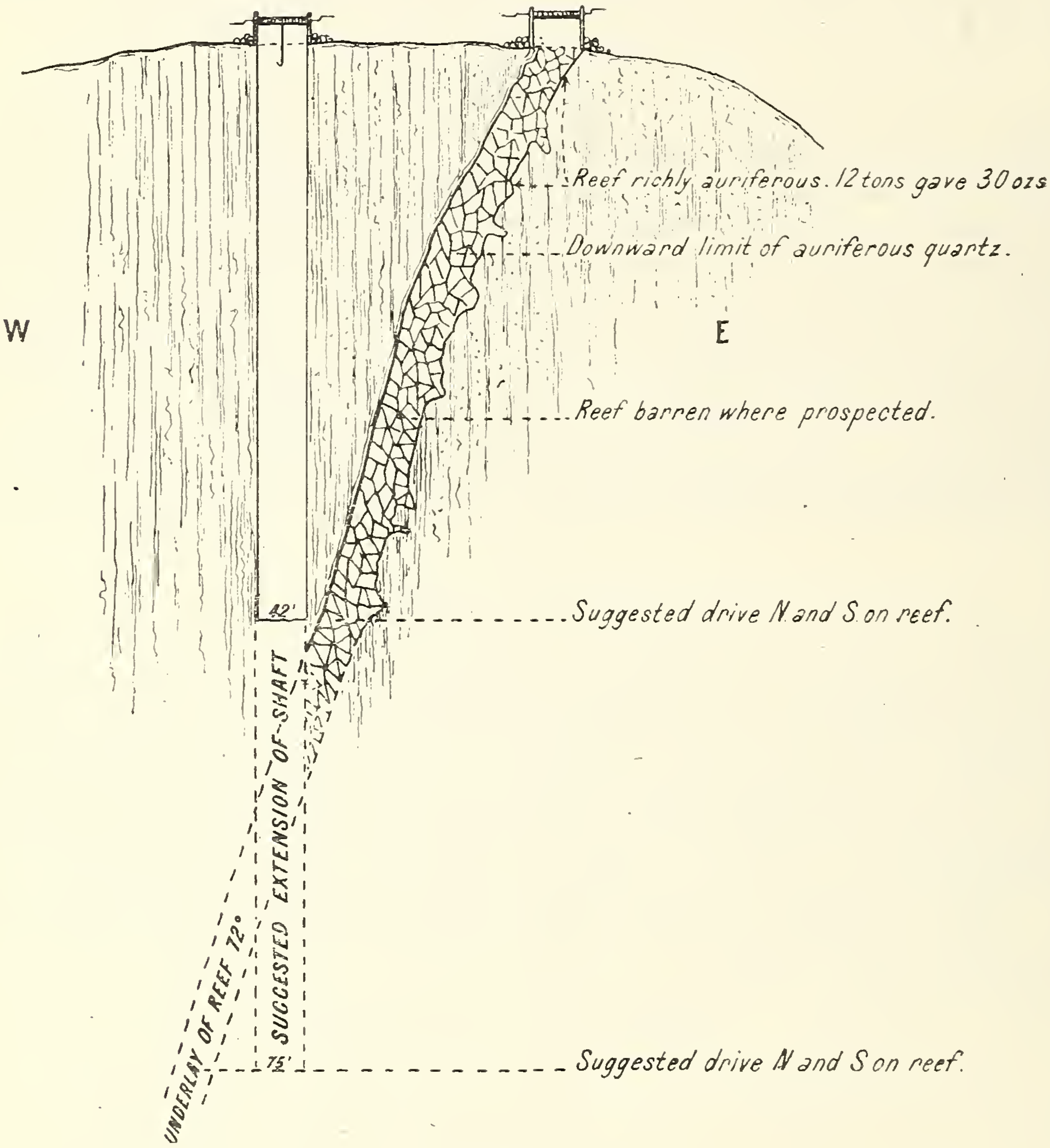

W
E
Reef richly auriferous. 12 tons gave 30 ozs
Downward limit of auriferous quartz.
Reef barren where prospected.
42'
Suggested drive N and S on reef.
SUGGESTED EXTENSION OF SHAFT
UNDERLAY OF REEF 72°
75'
Suggested drive N and S on reef.

Fig. 33.

Vertical Section: Scale, 20 ft. to 1 in.

A vertical shaft was sunk to the west by the prospectors, cutting the reef on its underlie at 40 feet; the bottom of this shaft has been connected by winze with the underlie shaft from which the gold was obtained, but nothing payable was intersected.

At 18 feet in the underlie shaft—that is just below where the gold was lost going down—rough levels have been extended about 23 feet both north and south, but with no success. Promising looking stone shows in both faces. No levels have been extended from the bottom of the 40-foot shaft.

It will thus be seen that beyond piercing the reef by an underlie shaft to a depth of about 25 feet below where the gold apparently cut out, this reef has not been prospected.

The "La Mascotte" reef is typical of the reefs of the Wedderburn field. It is a body of quartz ranging between 2 and 4 feet in thickness. It has a westerly dip varying from 62 deg. to 72 deg. and a strike of N. 5 deg. W. The hanging wall is clean and well defined, but the foot-wall is very irregular and penetrated at frequent intervals by "droppers" or quartz veins falling into the foot-wall country. The country intersected by the reef is much metamorphosed by the underlying granite; and at the La Mascotte Mine the beds are almost vertical or slightly inclined to the east—that is, the country and reef intersect at an angle of about 30 deg. As is frequently the case with reefs of this description the auriferous portions appear to occur in bunches, or short shoots, due probably to the nature of the country rock with which the reef happens to be in contact. In the case of the La Mascotte reef, however, I was unable to observe any of the carbon-bearing schists which seem to have influenced the deposition of gold in so many other of the auriferous reefs in the Wedderburn district. A noticeable feature in the La Mascotte reef is that where the gold occurs we have a "shoulder" in the wall of the reef caused by the reef changing its underlie from 63 deg. W. to 72 deg. W. In other places I have noticed such an occurrence to be favorable to the deposition of gold, and it may be the case here. If another make of gold should be found it should afford some valuable information for comparison.

Unfortunately it very frequently occurs in these mines, that, when the gold is lost, prospecting is carried on in a very disorganized way, a rise being put up in one place, a winze sunk in another, and so on in a disconnected manner, the result being that the mine is closed down without having received a fair trial.

As a business proposition the testing of the "La Mascotte" Mine is a simple one. The shaft at present down 42 feet should be continued to 75 feet. At 42 feet and at 75 feet, levels should be extended on the reef at least 30 feet in both directions, and the levels connected by a rise or winze. At a favorable point a cross-cut should be put out both east and west to guard against any formation being missed. If, by such work, gold should not be struck, nor very favorable indications disclosed, it would, in my opinion, be well for a small party to discontinue operations.

An estimate of such work could be obtained from the mine manager, and should not prove high as the ground is soft and stands well without timber.

[*Report sent in 1.12.05.*]

BURKE'S FLAT AND WEHLA.

By E. J. Dunn, Director, Geological Survey, Victoria.

FONE'S REEF.

This old mining locality is situate about ten miles in a N.E. direction from Bealiba. The principal reef worked here, and known as Fone's reef, was discovered in 1862. The country rock is Ordovician and of favorable aspect for gold. The soil is red, and the slate and sand stones are of pink and yellow colours near the surface, and they appear to belong to the Castlemaine zone, but no fossils have been obtained, so that the true horizon cannot be determined. The strike of the country is N., and its dip at the outcrop of the reef is W. at 52 deg. The strike of the reef is N.W., its dip S.W. at about 60 deg. The reef outcropped on a little rise, and there are numerous spurs crossing the country rock on both sides of the reef, which follows a well-defined fault line.

The length of reef worked at the surface was 150 feet, and it is reported that at the bottom of the workings the reef maintained the same length. The quartz ranged from 1 foot to 20 feet thick, and the whole of the stone is said to have been removed from the surface down to a depth of 750 feet on the dip of the reef, and to have been crushed. As over 100,000 tons of stone was raised and treated, this means that an average thickness of about 2 feet of quartz was removed from the lode. Mr. Martin, the former manager of the company, states that about 43,000 ozs. of gold was obtained altogether from the reef. This would give an average of about 8½ dwts. of gold per ton of quartz.

The reef was worked from 1862 to 1880. Since then the mine has been idle. Shafts were sunk so as to cut the reef on its dip, and the last shaft sunk is 650 feet deep, and 260 feet away from the outcrop of the reef.

From the bottom of the shaft a cross-cut was driven 109 feet south westerly to the reef. The shaft cut the reef about 440 feet from the surface.

This shaft is on the edge of a wide flat, and any future shafts would have to be sunk in the flat itself. Mr. Martin states that in the lowest workings the reef was well-defined, and that the water was not heavy, as an 8-inch lift was ample to deal with it. The tailings from this mine were saved and were worked over by a party of Chinamen soon after the mine was closed down. Mr. Stewart is at present engaged in cyaniding the tailings, and he has treated about 60,000 tons for a return of gold worth £17,000. There are still 30,000 tons to be dealt with that contain much pyrites, and that will require special treatment. To arrive at the original value of the quartz, the gold won from the tailings has to be added to that recovered by the several companies who originally crushed the quartz. Assuming that the 30,000 tons of tailings will yield the same proportion of gold as the 60,000 treated already, they would return £8,500. Added to the £17,000 from the 60,000 tons, this would be £25,500 as the yield by cyaniding. If the gold extracted by the Chinamen in the first instance was equal to this, then the gross yield would be £51,000 of gold for 90,000 tons of tailings. By adding a tenth as the proportion of gold that escaped in the slimes, or was washed away, this would work out about 3 dwts. per ton additional, say 11½ dwts. per ton for the stone as broken out. The gross quantity crushed is estimated at 100,000 tons, because the tailings account for 90,000, and at least 10,000 must have escaped by being washed away, and as slimes.

This mine appears, from Mr. Martin's statement, to have ceased work on account of a fall of rock, the result of having insufficient timber to support the ground. The reef is said to have been highly mineralized, and to have carried payable gold in the bottom of the workings.

To re-open the mine would require a new shaft to the south-west of the present deepest shaft, and the old workings would have to be unwatered.

The shoot of quartz worked occupies a channel which has not been prospected to any great extent. At 600 feet a level was extended S.E. for about 200 feet along the course of a well marked channel, but only a little quartz was met with. Further prospecting at the surface along the course of the channel appears to be desirable. All the gold found at Burke's Flat was very fine grained, and nothing of a nuggetty or coarse nature was found there, although it is close to localities that furnished some of the largest nuggets found in the State.

BURKE'S FLAT JIMMY'S REEF.

About 10 chains southward from Fone's reef is another reef called Burke's Flat Jimmy's reef. The strike of the reef is N. 40 deg. E., and its dip is 53 deg. eastward. The country rock consists of gray and yellow sandstones and slates. The quartz is about 1 foot thick at the surface, and Mr. Martin states that it was up to 4 feet thick in the bottom of the workings. The reef was stoped to a depth of 63 feet. At the time this reef was worked, it cost £1 per ton for carting and crushing, and the stone is said to have yielded between half-an-ounce and one ounce of gold per ton. This reef looks to be worth further prospecting.

THE LAY REEF.

This reef, which is from 6 inches to 12 inches thick, is on the Flat, and about 25 chains S. 20 deg. E. from Fone's reef. The strike of the reef is W. 15 deg. S., and its dip 56 deg. to the south. The soil is red, and the country rock yellow sandstone and slate of very ferruginous character, with abundance of quartz spurs. Three shafts were sunk, the deepest about 150 feet deep.

The country around Burke's Flat should be favorable for prospectors. Small reefs carrying gold are reported in several places in the neighbourhood.

Alluvial workings are crossed on the road to Bealiba, and there is a wide tract of country that requires careful exploration. A few miles to the eastward from the road between Burke's Flat and Bealiba there is a tract of country that has furnished the largest known masses of gold.

THE PRINCE OF WALES' REEF.

Five miles northward from Burke's Flat is Wehla, the site of extensive mining operations thirty years ago, when the Prince of Wales' reef was being worked. Sam's Wealth of Nations Shaft is the most northern of the workings on this line of reef; it is 330 feet deep and right in the township. Only the poppet heads now stand, and particulars as to the work done or results could not be obtained. Southerly from this shaft there is a great chasm, 500 feet long and 50 feet to 80 feet deep. The subsided cavity indicates that an enormous bulk of crushing material has been extracted. The workings are said to reach a depth of 300 feet from the surface.

The main reef occupies a fault which apparently has the same strike as the country rock, but which dips E. across the country. The strike of the country is N. 10 deg. W., and its dip is 60 deg. E. Quartz spurs on an extensive scale occur in the country rock on the E. side of the reef, and these appear to have been mined as well as the principal reef. The soil is of deep red colour, and the country rock is sandstone and slate of yellow and pink colours. It is of Ordovician age, and probably in the lower Castlemaine zone. The appearance of the country rock is most favorable for gold. Seams of limonite, associated with quartz spurs, are plentiful.

THE FRENCHMAN'S REEF.

This reef is about 5 chains S. of the S. end of the Prince of Wales' workings, and a little to the east of them. It is a very persistent line, and has been worked southward for over a mile along its strike, which is N. 15 deg. W. The dip is westerly at 72 deg. Pale yellow and brown sandstones and grey slates form the country rock. The reef is from 8 inches to 7 or 8 feet thick. The shafts do not appear to have been sunk more than about 80 feet from the surface. Alluvial gullies both on the E. and W. sides have been fed from this reef, and surfacing at different places has been worked right up to the outcrop of the quartz. Mr. Simms is the only miner working on the reef at present, and he states that the surfacing along the reef was worked 45 years ago and carted to Tarrengower to be washed, which would imply that it was rich in gold (8 ozs. per ton is mentioned). The gold in this neighbourhood is both coarse and fine. This very persistent line of reef, which has supplied so much alluvial gold, and which has been proved auriferous at several points, and has been worked down to only about 80 feet from the surface, should receive more attention. It appears to be well deserving of a proper trial.

About one mile from Wehla, on the road to Bealiba, is the Black reef, which strikes N. 10 deg. W.; this is supposed to be the continuation of the Frenchman's reef. Half-a-mile further from Wehla, and apparently on the same line of reef (Frenchman's), Mr. Gladstone worked a shoot of gold which he discovered by means of a loan of £100 from the Mines Department, and which he has refunded. The strike of the reef is N. 10 deg. W., and the dip 80 deg. E.

BRITISH SOVEREIGN MINE.

This mine is situate a little more than 1½ miles from Wehla, on the Bealiba road. The strike of the reef is N. 15 deg. W., and its dip 60 deg. W. The strike of the country rock, which consists of yellow and gray slates and sandstones, traversed by numerous quartz spurs, is N. 15 deg. W., and the reef and spurry country are together 2 to 4 feet thick. A great deal of work has been done here, and a vertical shaft has been sunk 140 feet W. of the outcrop.

These reefs and the adjacent country are well deserving of the attention of miners, and there is a good field for prospectors.

[*Report sent in 20.6.06.*]

REPORT ON A NEW RUSH AT MOLIAGUL.

By W. H. Ferguson.

The new rush near Moliagul is situated about 2 miles north-east of the township, 20 chains north of the road to Tarnagulla, in allotment No. 4, Sec. 11, parish of Moliagul. It is on a north-westward extension of Crump's lead, where some good nuggets were found in early days in shallow ground. Several of these nuggets weighed 20 ozs. and one upwards of 30 oz. The ground was abandoned some years ago, but lately Mr. J. Little re-prospected it and got 7 ozs. of gold, the largest slug weighing 4 ozs. 11 dwts. Just outside Little's claim a ·3 dwt. piece was found, but altogether very little gold has been won.

The new ground worked is not more than 3 or 4 chains long by ½ chain wide. The sinking is dry and shallow through granitic detritus, containing water-worn pebbles and nodules of ironstone, to the granitic bedrock which is rather coarse grained and has its surface cut up by small gutters and pot holes.

The district has been reported on by Messrs. E. J. Dunn,[1] O. A. L. Whitelaw,[2] and Jas Stirling.[3] In Mr. Stirling's plan the site of the rush is marked Newer Pliocene resting on granite, and he shows Ordovician strata about 50 chains to the north and about the same distance to the south.

The main workings at Crump's lead are not more than 10 chains in length. From the gully at the end of the lead the country rises to the north and west and slopes past Little's claim to a broad gently sloping granite ridge covered with from 2 feet to 6 feet of detritus. There does not appear to be a distinct lead. North or north-west of Crump's lead patches of coarse gold occur on the bed rock.

The question of the origin of the gold must now be considered. Mr. Little prospected a reef in the granite in the locality and it yielded a little fine gold. However, all the alluvial gold has been coarse. The quartz reefs in the surrounding Ordovician rocks have been very rich and yielded large masses of gold. On Mr. Stirling's map the Matrix or McEvoy's reef is shown about 3½ miles to the north-west, and with such a bearing that its continuation would pass close to Crump's lead. Large masses of gold were found in the reef and in the detritus from it. Nuggets weighing 810 ozs., 805 ozs., and 782 ozs. are recorded, while Mr. Whitelaw records that gold to the value of £2,600 was removed from the reef in a few hours at a depth of 54 feet from the surface. No doubt the Ordovician rocks were once continuous over the site of the lead and they contained quartz reefs. As they weathered away, the gold from the reefs would be left behind. This seems the most probable theory to account for the gold.

When the present rush began, an attempt was made to trace the lead up the hill. Perhaps 100 holes from 3 to 6 feet deep were sunk altogether, but no gold was obtained. In spite of this I do not consider that the place has yet been thoroughly prospected. Perhaps the best method would be to make parallel trenches across the direction of the supposed lead, but even then rich patches of gold and nuggets might easily be missed.

To the south-east, on the side of the valley opposite to Crump's lead, and at about the same level, there is similar ground and this does not seem to have been prospected.

[*Report sent in 31.7.05.*]

THE NEW RUSH AT PATCHY FLAT, NEAR DUNOLLY.

By W. H. Ferguson.

The new rush at Patchy Flat is situated about two miles S.S.E. of the township of Dunolly, and is about 630 feet above sea-level. The ground is portion of a lead which was worked a number of years ago. When the alluvial deposits along the creek and gullies running into it were worked, the site of the present rush was missed, and it was found to be auriferous only about a month ago.

The old workings are shown on Mr. S. Hunter's geological sketch map of the parish of Dunolly. They are to the east of, and close to, allot-

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(1) Notes on the Rheola Gold-field. Quart. Rept. Dept. Mines, Vict., 30th June, 1890.

(2) Geological Survey of the parish of Moliagul. Geol. Surv., Vict., Prog. Rept. No. XI., 1899.

(3) Report on the Mining Features of portion of the Moliagul and Dunolly Districts. Geol. Surv. Vict., Monthly Prog. Rept. No. 3, 1899.

ments 1 and 2 of section K. The ground now worked is approximately 20 chains in length, and the lead is from 1 to 1½ chains wide. The gold does not appear to be confined to a defined "run," but as far as proved, occurs in patches on the bed-rock, which is from 14 to 20 feet from the surface. The sinking is generally through clay, and the sides of the shafts stand well without timber. Two men can bottom a shaft in two days. There are about 80 men on the field, and all the ground has been taken up in claims. The "bottom" consists of Ordovician slates and sandstones, with quartz veins. All the gold is said to be water-worn, but a small fragment which I purchased was rough. It certainly appears to be of local origin. It is said that "specimen" gold—gold with quartz attached—does not occur. The gold, which is worth £4 per oz., is generally fine, and the heaviest piece yet found weighed 2 dwts. According to the miners on the field, the amount of gold obtained in the claims is not great, but I gathered that all the men working on the lead are making wages, and some are doing considerably better. A load of wash-dirt yields from 6 to 16 dwts. of gold. The wash-dirt varies from 1 foot to a few inches in thickness, and the stones in it are generally angular and sub-angular. It is puddled in a trough; then cradled, and panned off. At present there is sufficient water in the creek for these operations, and there are two large dams within a short distance of the claims. At the time of my visit the ground to the west was being prospected to find if the lead takes a westerly turn, instead of continuing down the creek past the old workings. The result, however, was not encouraging, as the holes bottomed at shallow depths. Even should the lead not extend westward, it is quite possible that runs of alluvial gold may join it from the flat and slightly inclined ground in allotments to the west (Nos. 1 and 2 of section K).

A few notes on the geology of the country immediately surrounding the workings are added. The bed-rock appears to consist of Ordovician slates and sandstones. No fossils were noted in the area under review, but about four miles to the north, Lower Ordovician (Lancefield division) graptolites were found in the slates. Around Dunolly the Ordovician rocks have been slightly metamorphosed. Most of the slates are silky, micaceous, and spotted, and there are also light bluish greasy slates and black and reddish slates. The sandstones are micaceous and hard. They are of various colours, and fine to medium in texture. A considerable amount of dark red ferruginous rock, locally termed bloodstone, occurs, and fragments of it were frequently noted on the old alluvial waste-heaps in some of the gullies.

The strata generally strike N. 15 deg. W., and dip either E. or W. Quartz, as veins, spurs and reefs up to 3 and 4 feet thick, is common. A little more than quarter of a mile westward from Patchy Flat, in a cutting on the Dunolly-Maryborough railway line, there is a dyke 3 feet wide, striking nearly E. and W. The dyke is decomposed to a brown sandy mass. It may be granitic, but is more probably one of the diorite series. The Ordovician strata at the dyke show faulting. Veins of quartz run through the dyke in various directions, and are of more recent age than those in the Ordovician rocks. I am not aware whether any such dykes have been worked in this district, but this one appears to be worth prospecting. At its intersection with a favorable band of country rock it may prove auriferous.

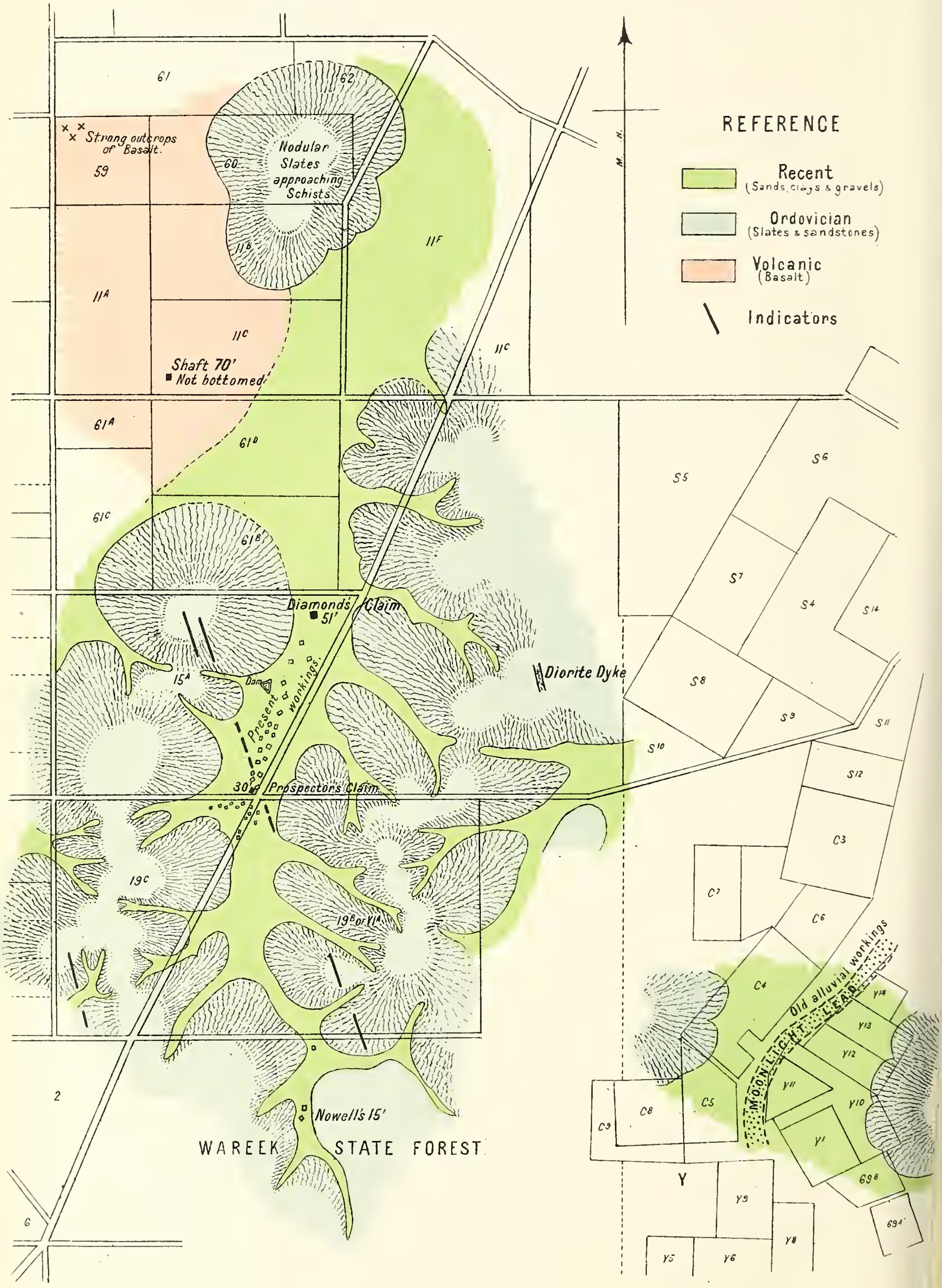
As the Ordovician rocks weather away they liberate much quartz and form clay, sandy clay, and loam. About 20 chains south-eastward from the Patchy Flat workings, the Ordovician rocks strike from N. to N. 10 deg. W., and dip easterly at 70 deg. They are mostly slates, and are

BRITISH MUSEUM
NATURAL HISTORY

Sketch Plan

WAREEK RUSH

Scale, 40 chains to One inch.



capped with from 2 to 3 feet of "reef-wash" (clay, with angular fragments of quartz) like that from which gold is obtained around Dunolly. The working of such deposits (surfacing) has led to the finding of many fine nuggets. Alluvial gold is obtained from deposits along the present creeks, and from deeper leads under extensive alluvial deposits. It is also found in the gravels which cap low hills in the locality. These gravels appear to be the remnants of a once continuous deposit.

Just below the workings at Patchy Flat on the western sides of White Hill and Spiller's Hill, and on the eastern side of Gooseberry Hill, there is a thick deposit of these gravels, flanking or capping the ridges of older rocks. They are composed principally of small, well water-worn quartz pebbles, with some rounded boulders of quartz measuring 18 inches to 2 feet in diameter. In places the gravels are cemented, and form a ferruginous conglomerate.

From the appearance of old workings these high-level gravels have yielded much gold, and gullies trending from them have been rich. These gravels were not noted on the up stream side of the workings at Patchy Flat, so it is probable that the gold of this place has been derived directly from local quartz, and that most of it has not been transported far from the spot where it is now being found. This inference is supported by the angular character of the quartz in the wash of the workings.

The sketch plan already mentioned shews that the United Kingdom reefs, about one mile to the south, and the Spread Eagle reefs, about 1½ miles to the north, and Patchy Flat, are practically on the same line. This circumstance should encourage miners to prospect the unworked alluvial ground near the site of the rush.

[*Report sent in 5.6.05.*]

THE WAREEK ALLUVIAL RUSH, NEAR MARYBOROUGH.

By A. M. Howitt.

The Wareek alluvial rush was opened by Messrs. Dellar and Craig, who found gold in an old abandoned shaft on the cross roads at allotments Nos. 15^A and 19^B of VI^A., parish of Wareek, county of Talbot It is about 8 miles west of Maryborough (*viâ* Alma).

On the attached sketch plan are shown the prospectors', Nowell's, and Diamond's claims, and the 70-ft. shaft reported not bottomed; and also the Moonlight Flat lead, the nearest alluvial workings of importance, which are situated 1½ miles south-east of the rush in allotment C^4.

The sinking so far has been on a wide flat passing through allotments Nos. 15^A and 19^B of VI^A., and the adjacent Crown lands, and a narrow payable gutter has been proved for about 8 chains north of the prospectors, all being in allotment No. 15^A. (J. Porteous.)

The gutter is about 12 feet in width near the prospectors' claim, but has narrowed considerably in some of the claims to the north. It takes slight bends in its course over a bed-rock of Ordovician ironstone, slate, and soft sandstone. The deepest shaft on the rush is 51 feet ,and was sunk by Diamond and party. One and a half grains to the dish is reported to have been obtained off the bottom; but where gold is being got near the prospectors' claim the sinking is about 30 feet through iron-cemented fine gravel, sand, and clay, with occasional thin runs of white pug and fine white gravel; and then through 1 ft. 6 in. to 2 ft. 6 in. of iron-cemented sub-angular gravelly wash containing ironstone boulders, but very little quartz wash. Most of the coarser gold has come from a pipeclay and white fine gravel right on the bottom, but nice specks can be got 2 feet up in the wash.

The gold is remarkably clean, heavy, and round; and is valued at about £4 1s. 3d. per ounce.

From the several claims where gold has been struck I may quote the following yields:—Machines of about ten loads each for 5 oz. 2 dwts., 1 oz. 10 dwts., 3 oz., 5 oz. 10 dwts.; and other machines for 4 dwts. and 8 dwts. per load. In addition to mine yields, 5 dwts., 8 dwts., 14½ dwts., and 1 oz. 12 dwt. pieces were picked from the faces.

Already there are two narrow gutters known, one (the eastern), being barren near the prospectors, and even now there is some doubt about the trend of the gutter a few claims north of the prospectors, and on past Hoskins' claim, where it is very narrow. There is now a possibility of a gutter being traced west of No. 3 north claim. Eventually if the gutter is traced northward across the road into allotment 61^{B} it should bend to the north-west and run under the basalt, which will first be met with in allotment 61^{D}; and thence on to junction with the deep ground along the Bet Bet Valley, already kown to be 206 feet deep at Wareek township, about 2 miles distant. In allotment No. 11^{C}, an old shaft, sunk through the basalt, sand and clay, is said to be over 70 feet deep. At the south end of the flat there should yet be room to trace the gutter, as 60 chains south of the prospectors' claim, near the head of the gully, Nowell and party have obtained fair gold at a depth of 15 feet from a white water-worn quartz wash apparently derived from an old cross wash.

This water-worn quartz wash has not so far been seen except just east of the prospectors' claim at 20 feet deep, off the run of gold, but at least some few boulders of this wash should be traced in deeper ground near by.

So far the results to the south have been disappointing, and so nearly all efforts are now concentrated to the north of the prospectors. A short shallow tributary coming in from the west, and carrying a fair sample of gold, is now being prospected, and its value should be known in a few days. It would junction with the main lead not far from the prospectors' claim. The hills adjacent to the flat are formed of Ordovician slates, sandstones, and ironstone, striking N. 15 deg. W. at a slight angle to the general trend of the gutter. No quartz reefs have as yet been worked near by, but an indicator belt crosses the lead and tributary feeder mentioned above.

[*Report sent in 26.8.05*].

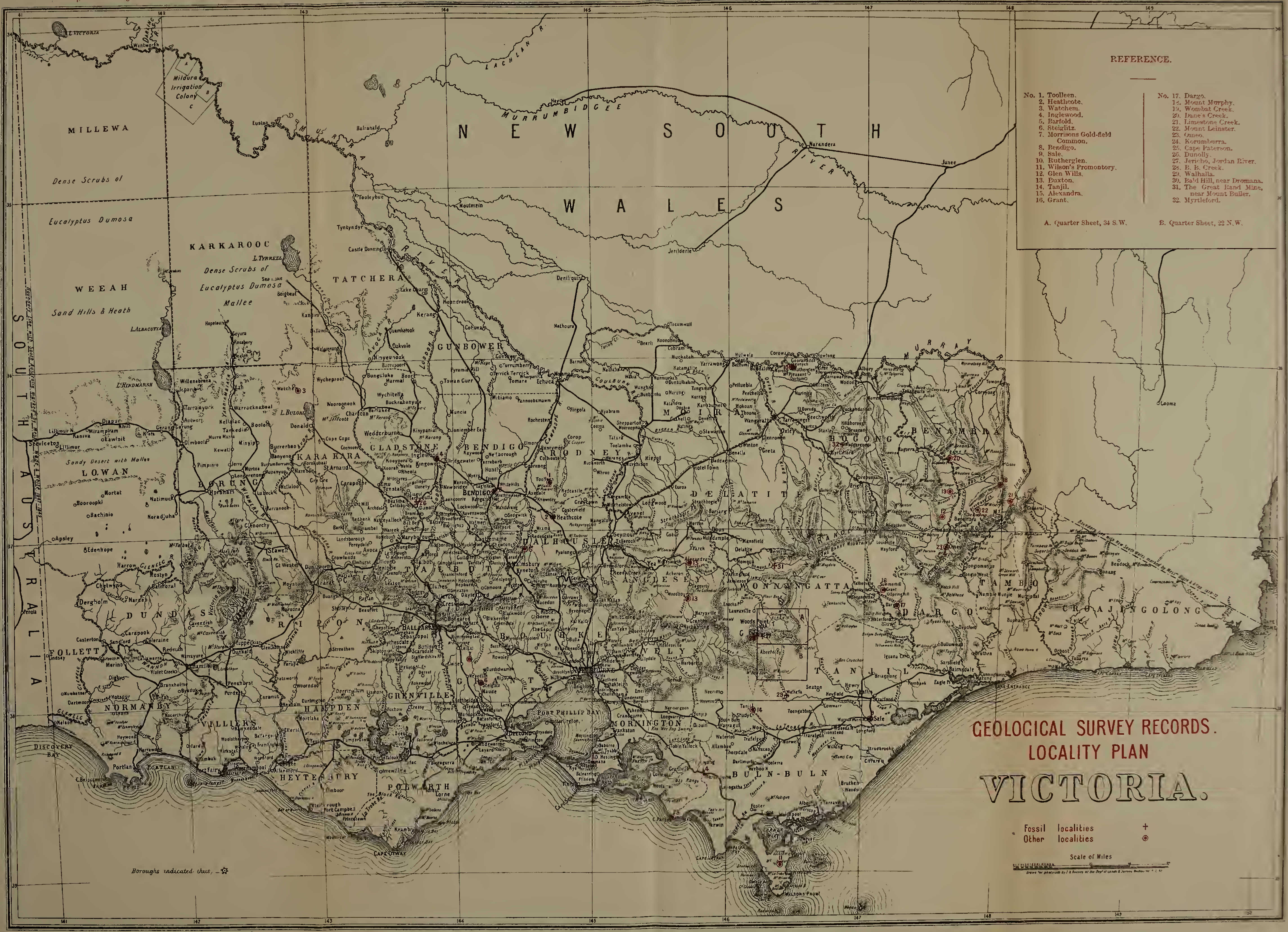
THE MARYBOROUGH LEVIATHAN GOLD MINES LIMITED.

By A. M. Howitt.

The Leviathan reefs are in the western Maryborough dyke belt, and the strata met with in this belt are mainly slates, sandstones of various textures, and quartzites, all of Ordovician age.

The quartz reefs nearly follow Chinaman's Flat Lead (parish of Maryborough) from the head northwards to Timor.

The beds strike about N. 15 deg. W., and where noted dip about 60 deg. to 65 deg. east.



GEOLOGICAL SURVEY RECORDS.
LOCALITY PLAN
VICTORIA.

Fossil localities +
Other localities ⊙

Scale of Miles

REFERENCE.

No. 1. Toolleen.
2. Heathcote.
3. Watchem.
4. Inglewood.
5. Barfold.
6. Steiglitz.
7. Morrisons Gold-field Common.
8. Bendigo.
9. Sale.
10. Rutherglen.
11. Wilson's Promontory.
12. Glen Wills.
13. Buxton.
14. Tanjil.
15. Alexandra.
16. Grant.
No. 17. Dargo.
18. Mount Murphy.
19. Wombat Creek.
20. Dane's Creek.
21. Limestone Creek.
22. Mount Leinster.
23. Omeo.
24. Korumburra.
25. Cape Paterson.
26. Dunolly.
27. Jericho, Jordan River.
28. B. B. Creek.
29. Walhalla.
30. Bald Hill, near Dromana.
31. The Great Rand Mine, near Mount Buller.
32. Myrtleford.

A. Quarter Sheet, 34 S.W.
B. Quarter Sheet, 22 N.W.

BRITISH MUSEUM
NATURAL HISTORY

The reef strikes about N. 22 deg. W., and its dip changes from westerly to easterly. Where it dips to the west and crosses the eastern strata at an angle the stone has been most profitable.

The main reefs worked in this mine have been the "Eastern" and the "Western," which have been followed from where Sharp and Barry and others worked so profitably.

The following brief description of the developments down to the 960-ft. level is given from information supplied by the manager, Mr. Wm. Nicholas, senior, and Mr. F. Nicholas, as well as from reference to the mine-plans and sections, and my own geological notes.

From the surface to the 360-ft. level, the underlie of the reef (Western Reef) was 60 deg. west. It had a good hanging wall and a broken footwall. The yield was approximately 26,943 oz. of gold for 51,218 tons of ore. Between the 296-ft. and the 360-ft. levels large masses of eastern quartz spurs were worked for poor yields.

From the 366-ft. level to the 560-ft. level this reef was nearly vertical and unpayable, but between these same levels the "Eastern Reef" was payably mined, the reef underlying 45 deg. west, and the slate and sandstone beds dipping east at about 65 deg.

Just below the 560-ft level the Eastern and Western Reefs junctioned and then the combined reef dips east at 60 deg.

Between the 700-ft. and 800-ft. levels a large break occurred coming in from the west. This was seen again cutting the strata just before the Western Reef was cut at the 960-ft. level. The reef at this level was much disturbed, and contained broken masses of country rock, makes of quartz and pieces of dyke rock, the latter, no doubt, derived from the western dyke. At this level the Western Reef was practically non-auriferous.

At each level a wall-like dyke 12 feet wide (termed the western wall) was cut. It is nearly vertical from 360 feet to 560 feet and then underlies slightly to the east in the lower levels, and is disturbed at the 960-ft. level. This rock has been classed with the minettes by Mr. D. J. Mahony, M.Sc. It is one of the two main vertical intrusive dykes in the mine. It may be here added that at the 460-ft. level a nearly horizontal similar intrusion cut the Eastern Reef, and that the pitch of the payable shoot in the reef formation followed this dyke (south 1 in 10). The ore above the horizontal dyke was payable, but a little below became poor.

Again at the 700-ft. level another flat dyke was found, but around it the reef was unpayable, yielding only 1½ dwts. of gold to the ton. This dyke is said to pitch north.

Although the ore at the 700-ft. level was, in the main, of no value, there was one large bulging block of quartz (apart from the other makes) worked out, 2,500 tons yielding 5 dwts. of gold per ton. The total amount of quartz mined by the company on the Eastern and Western Reefs and spurs is given as 110,174 tons, yielding 29,390 ozs. of gold, or an average of 5.33 dwts. per ton.

New Reef (Old Leviathan Line.)

The new reef cut at the 960-ft. level is on the Old Leviathan line of reef formations, which were so rich at the surface north of this mine.

From the surface to 240 feet (at a point in the north-east portion of the lease) the Old Leviathan averaged for a long time 1 oz. per ton, and the ore was 10 feet to 20 feet wide. At no point lower than 300 feet has this line been worked.

At the 220-ft. level, above the new reef (Old Leviathan line), spurs were met with carrying a little gold, about 1 dwt. per ton.

Directly below, in the 460-ft. level, a few tracks bringing in water and gas, and one lode track carrying quartz, were cut, but not a prospect of gold.

The 960-ft. level, the next level at which the Old Leviathan Reef formation was cut, shows a splendid quartz reef with encouraging prospects, and going strongly under foot south. On this new reef, drives N. and S. extend for 100 feet each way, and the ore taken out 40 feet north and 100 feet south yielded about 2 dwts. to the ton, 600 tons have been crushed in all.

It is noticeable that at 60 feet west of this new reef there is an intrusive dyke 15 feet wide, dipping 60 deg. east, and as the reef is nearly vertical to slightly west, they may meet one another, or one of the horizontal offshoots of dyke-rock may pass through the reef, as even now much felspar (plagioclase?) is present in the reef. In this district, when felspar can be found in a reef, there is always an intrusive dyke close by, and generally an adjacent shoot of gold, and, so far, I have noted only one exception in the country examined around Maryborough. In the New Reef, fairly coarse gold occurred together with zinc-blende, copper pyrites, iron pyrites, and galena. I saw this auriferous make in a fairly large reef formation, and, since my visit, Mr. Nicholas informs me that, when left, the reef was 6 feet wide, with a 3-in. vein near the middle, and two good walls. The 3-in. vein carries good gold, and is rich in the sulphide ores, as mentioned above. Good specimens from the small vein can be seen at the mine. In addition to the two large reefs referred to, a true fissure reef occurs between the Western and New Reefs. This is very narrow, carries gold and sulphides, and runs nearly vertically through the mine workings. At the 960-ft. level, this middle reef is hard to locate, but may be on the dyke, where a make of quartz occurs, at present of no value.

These reefs should be developed by sinking and cross-cutting at deeper levels, where more settled country under the break should be found. The two main vertical dykes accompany the reef formations from the surface downwards, and, as the dykes must go down to a great depth, there is every chance of the reefs doing likewise.

Developments at lower levels, if attended with success, will be of the utmost importance to future quartz mining at deep levels in the Maryborough district, and have special bearing on a belt extending some miles, in which the promising reefs of Mariners' Hill, Bristol Hill, and the North Leviathan lines occur.

This mine has done good work, having proved gold-bearing quartz several hundred feet deeper than hitherto known in this district, and its machinery and plant are especially well equipped for deep sinking.

[*Report sent in 16.7.06.*]

KIRK'S REEF, MARYBOROUGH.

By E. J. Dunn, F.G.S., Director, Geological Survey.

Kirk's Reef is situated in Ordovician slates and sandstones, on Pound Hill, about one mile N.E. of the town of Maryborough. The strike of the reef is N. 22 deg. W., and it dips easterly at 70 deg. Mr. A. M. Howitt pointed out to me that this reef is cut by three nearly horizontal dioritic dykes. At 25 feet from the surface a dyke 4 inches thick cut right across the reef. The gold contents increased from 1½ dwts. per ton at the surface to 7½ dwts. per ton near the dyke. At 40 feet deep a dyke 1 foot 10 inches was met with cutting through the reef. The quartz near the dyke yielded 6 dwts. per ton. A third dyke has been cut about 60 feet from the surface. These flat dykes extend laterally over a wide area, and the top one can be traced about one mile away. That this class of dyke exercises a direct influence on the gold contents of the reefs they intersect appears to be proved, and Mr. Howitt is engaged in working out their relations.

[*Report sent in 20.6.06*].

THE COCKATOO FLAT RUSH, PARISH OF TCHIRREE.

By Stanley Hunter.

The Cockatoo Flat rush is situated in the north-eastern portion of the parish of Tchirree, county of Kara Kara. In company with Mr. Withecombe, the original prospector, and several of the miners, I went over the claims and made a general examination of the locality, which is at the lower end of a sloping plain, dissected by numerous small water-courses from 6 feet to 8 feet deep. The sinking is from 45 feet to 48 feet deep, through clays, ferruginous sand, and sandy clay, to a big sub-angular quartz wash. Many of the quartz masses are more in the form of slabs than of boulders. The wash dirt so far tested is from poor to fair, but nothing that can be called rich has as yet been found. The largest piece of alluvial gold found to date weighed 3½ dwts. The bed-rock is a green slate, intersected by numerous quartz veins. It is impossible to indicate the best position in which to sink future shafts, and this fact, I think, is recognised by those on the field having the best knowledge of mining. The outcropping Ordovician rocks are so far apart that there is room for several small leads between them. No defined gutter has been proved, and the large sub-angular quartz wash rests on an almost perfectly flat bottom. The suggestion that the miners should form a co-operative party among themselves to try boring operations apparently did not find favour with them. Under the circumstances, I cannot make any suggestion regarding future shafts, as I am of opinion that it is one of those cases in mining where the element of chance forms the predominant feature.

[*Report sent in 18.6.06.*]

THE BYRON REEF, NEWSTEAD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This mine is about one and a half miles south-westerly from Newstead. The locality is interesting, because it represents an island of auriferous rocks surrounded by barren country.

Apparently the beds which occur on this site are the topmost auriferous beds of the Castlemaine zone. This is inferred from the fact that no alluvial gold has been obtained from the gullies around the Byron mine. Quartz fragments are thickly strewn over the little knoll on which the shaft has been sunk, and auriferous quartz was exposed at the surface.

The bed consists of grey sandstone and slate of grey colour; some of the sandstone weathers brown on account of the carbonate of iron present. The soil is red.

A shaft 920 feet deep has been sunk. At the 520-ft. level a reef was cut in a cross-cut 25 feet E. of shaft. It was 2 feet thick of mixed quartz and country rock. A small reef lying in the bedding plane was worked for 200 feet N. of the cross-cut and S. of the cross-cut for a length of 300 feet. In the W. cross-cut and N. of the shaft the country dips E. A fault occurs also dipping E. From the 200-foot level to the 600-foot level a reef about 400 feet long was worked profitably, the manager informs me.

At the 780-foot level in cross-cut E. from shaft the rocks dip E. at 58°. This cross-cut is 110 feet long. In the south level the pitch is southerly at about 20°. A quartz reef has been followed in this level for 150 feet. It was as much as 8 feet thick on the N. end, but tapered out to nothing in a southerly direction. At 400 feet south of the cross-cut a "floor" or fault lying at a low angle was cut. It dips E. This "floor" has been followed up on its course in a W. direction, and a little quartz with occasional colour of gold was obtained along the "floor." At 200 feet S. of the main cross-cut in the level a cross-cut has been extended E. for 80 feet in much-disturbed country. At the shaft the pitch of the country appears to be northerly.

At the 920-foot level the beds dip E. at 85°; the country consists of slate and sandstone much more settled than in the higher levels, and of more favorable appearance. The upper workings of this mine shew many faults and much displacement, and it is probably owing to these movements of the rocks that auriferous country is exposed at the surface. The shaft is in country that dips E., and therefore any cross-cutting for centre-country must be to the W. Very little has been done so far in the way of cross-cutting to the W.

As the more productive Bendigo zone lies deeper down than the present workings, the shaft should be deepened. The site of the shaft is a good one, because the pitch falls away from it to N. and S., and it is in E. dipping country rock. Should this mine enter a more productive zone at deeper levels, it would be the means of opening up an auriferous zone that is masked by barren country except at this spot.

[*Report sent in 5.12.06.*]

THE METEOR MINE, NEWTOWN, NEAR SCARSDALE.

By John Easton.

The Meteor Gold Mine is situated about 1 mile to the east of the township of Newtown, near Scarsdale.

The country rock consists of grey sandstones, mudstones, and slates of Ordovician age. The general strike is N. 3° W.

A main shaft has been sunk, and two cross-cuts opened out at 350 and 400 feet, both driven to the east.

The No. 1 cross-cut is at a depth of 350 feet, and is 223 feet in length. At about 80 feet from the shaft it passes through a well-defined anticlinal fold. The strata on the west side all dip at from 80° to 85° to the west, and on the east side, to the end of the cross-cut, dip east at from 70° to 80°. The pitch of the fold is about 20° to the south. At 69 feet east of the shaft a drive has been made 171 feet south, along the western leg of a saddle formation. This leg, where found in the cross-cut, was only about 8 inches in width, but it continued to widen out to the south owing to its getting nearer to the cup of the saddle, which pitches south.

In the present face, this lode is about 12 ft. 6 in. wide, with inclusions of sandstones, and looks as if it was almost on the roll of the saddle, with a body of stone continuing overhead from the hanging wall.

The reef contains a good deal of pyrites, some of which is of a very fine nature.

A crushing of 102 tons from this lode gave a return of 46 oz. 1 dwt. of free gold.

The hanging wall of this leg is a well-defined sandstone bar, whilst the foot-wall is a nice slate.

At 83 feet from the shaft the cross-cut passed through an eastern make of quartz, about 6 inches thick, which appears to be the eastern leg of the same saddle. Again, at 98 feet, about 1 foot of quartz was found in a stratum of black slates dipping about 70° to the east. It probably forms the eastern leg of another saddle reef. At 185 feet, another make of quartz, 1 foot wide, occurs interbedded with the strata; also, at 211 feet, there is a big lode formation, whilst at numerous places along the cross-cut small veins of quartz are seen in the bedding plains.

At 99 feet from the shaft, No. 2 drive north was opened, and at 16 feet in this drive, a rise with an easterly underlie was put up 50 feet in spurry country, and a cross-cut driven to the west from the top of the rise. At 10 feet, the cross-cut intersected a lode about 1 foot wide in the bottom, and apparently widening as it rises, and conforming with the strata, which dips 80° eastward, and at 40 feet it cuts old stopes with a slight dip to the west with the country, these two formations apparently forming east and west legs.

At 41 and 58 feet in the main cross-cut, two formations also occur in beds of nice dark slate. The first is about 18 inches wide, and carries some nice laminated quartz. These beds dip to the west at about 80°, and are again found in a similar manner in the lower level.

At the 400-foot level, the cross-cut has been driven 948 feet to the east In this cross-cut, two well-defined anticlinals are passed through, the first at about 95 feet, and the second at 625 feet. At 73 feet from the shaft, a main drive southwards follows a west leg, which has averaged about 4 feet in width. At 102 feet south there is a cross-course which shifted the lode some distance to the west. This break was followed for 57 feet before the continuation of the lode was again picked up. The length of this drive, to date, is 182 feet, and the lode in the south face is about 4 feet wide, and dips about 70° to the west, with a well-defined sandstone hanging wall and a slaty foot-wall.

The quartz is of a bluish tinge, with small inclusions of slaty material, and contains a considerable quantity of pyrites, and nice samples of gold can be seen at times.

A crushing of 80 tons, taken from the north side of the break, resulted in a yield of 7 oz. 10 dwt.

At about 120 feet in the cross-cut, a short drive has been opened to the south, on a lode which underlies to the east.

One hundred and fifty-two feet in the cross-cut drives have been opened to north and south on a big make of stone.

Again, at 796 feet, a drive to the north cuts a series of quartz spurs, which vary in width from 3 inches to 1 foot. All these pitch to the south at about 10°, and underlie slightly to the west, cutting across the bedding, which at this point is strongly to the east, and has a prevailing easterly dip to the end of the cross-cut. Some of these spurs yielded good gold in patches.

A considerable amount of surface work has been done for some hundreds of feet to the north of the present workings, on what appears to have been a mass of spurry country. These workings were carried down to some 300 feet, and some very good gold is said to have been obtained.

Mr. McLeish, the manager for the company, informed me that in the old surface workings, about 900 and odd feet to the east of the present shaft, an indicator, in the form of a seam of mineral, about 1½ inches in thickness, was worked to a depth of about 125 feet, and that some exceedingly coarse and rich gold was obtained from the quartz in the vicinity of this indicator, but he has not yet been able to locate same in the present workings.

[*Report sent in 25.8.05.*]

STAR OF THE EAST MINE, BERRINGA.

By John Easton.

The Star of the East mine is situated about 3 miles due east of the township of Berringa, and on the south side of Mount Misery Creek, in the parish of Lynchfield, and is at present being worked by a local syndicate, which has two men employed in prospecting operations.

The country rock is Ordovician strata, composed chiefly of white, grey, and brownish slates and sandstones, with occasional beds of micaceous sandstones and greenish slates. It has been folded into synclinals and anticlinals. The prevailing dip, however, is to the east. This can be noticed for some distance westward. The general strike is about N. 13° W.

The Star of the East reef is shown on the geologically-coloured parish-plan as the Cockatoo Line of Reef, and was originally worked some 42 years ago along the outcrop. Numerous shallow shafts and open cuts have been made from Mount Misery Creek for fully a mile to the south, but these operations do not appear to have been extended to a greater depth than about 30 feet, and, as most of this work was done many years ago, no records regarding yields or amounts crushed are obtainable.

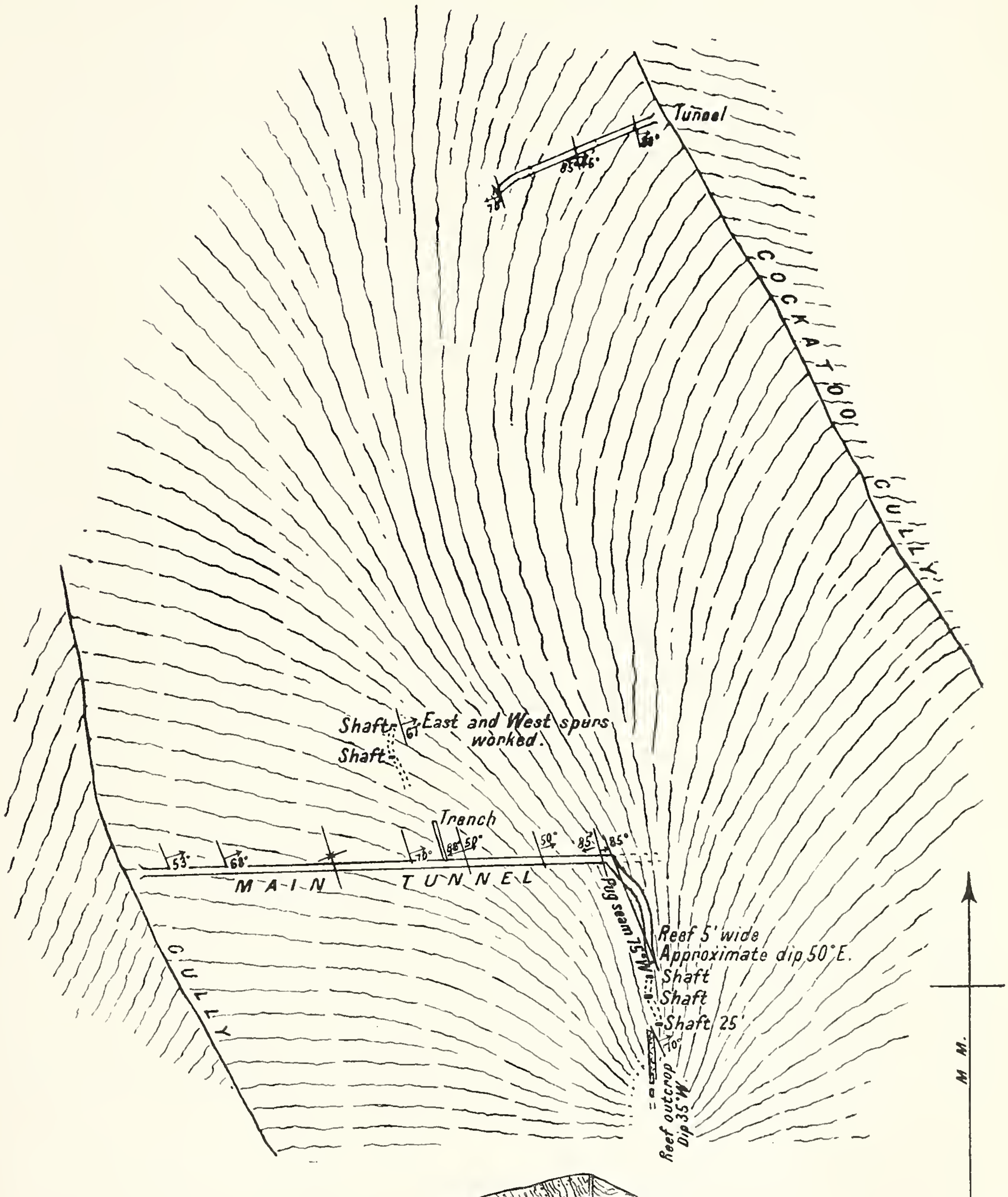
Mr. J. Aird, the manager for the present syndicate, informs me that the outcrop immediately over the present workings is reported to have yielded as high as 7 oz. to the ton. About 30 chains further south, a parcel of ore is known to have yielded ½ oz. of gold per ton.

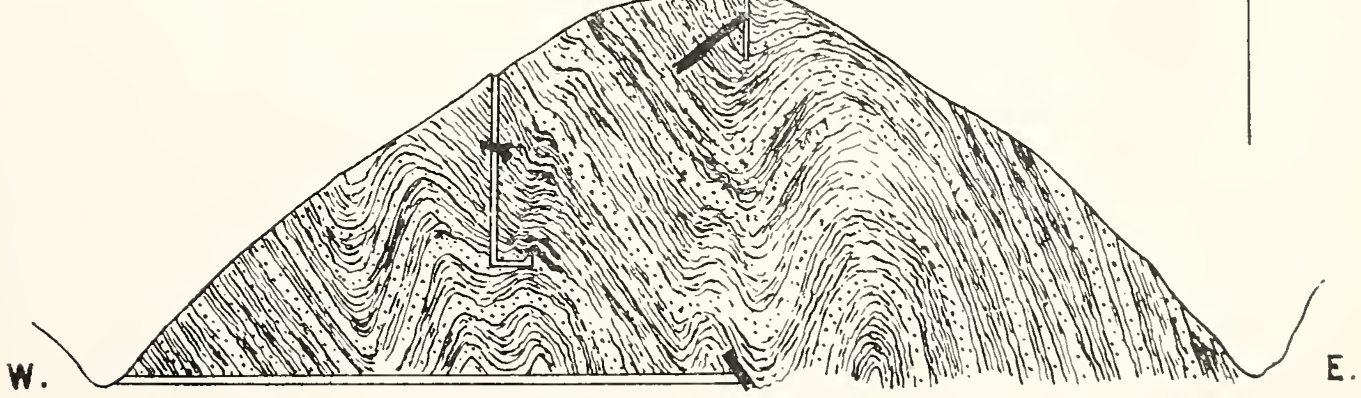
Several small crushings have of recent years been taken from the two shafts, shown on the accompanying plan, to the north of the main tunnel, and some chains to the west of the main outcrop. These were extracted from several east and west spurs, which pitch to the north at from 25° to 30°, and vary from 6 to 18 inches in thickness, with the strata dipping about 67° to the east. These spurs were worked to a depth of 60 feet by means of a shaft. Yields up to 6 dwts. per ton were obtained from them. The last crushing from this shaft was taken out by a party of tributers who obtained 3 dwts. to the ton from 18 tons. Mr. Bradford also crushed a parcel from a surface trench a few chains further to the south, and obtained 7 dwts. per ton. These are the only crushings treated from this lease of late years.

PLATE XIX.

PLAN
STAR OF THE EAST MINE
BERRINGA

Scale, 4 chains to One inch.





SKETCH SECTION

Showing relation of Reefs and Strata

Vertical scale, 100 feet to One inch.

BRITISH MUSEUM NATURAL HISTORY

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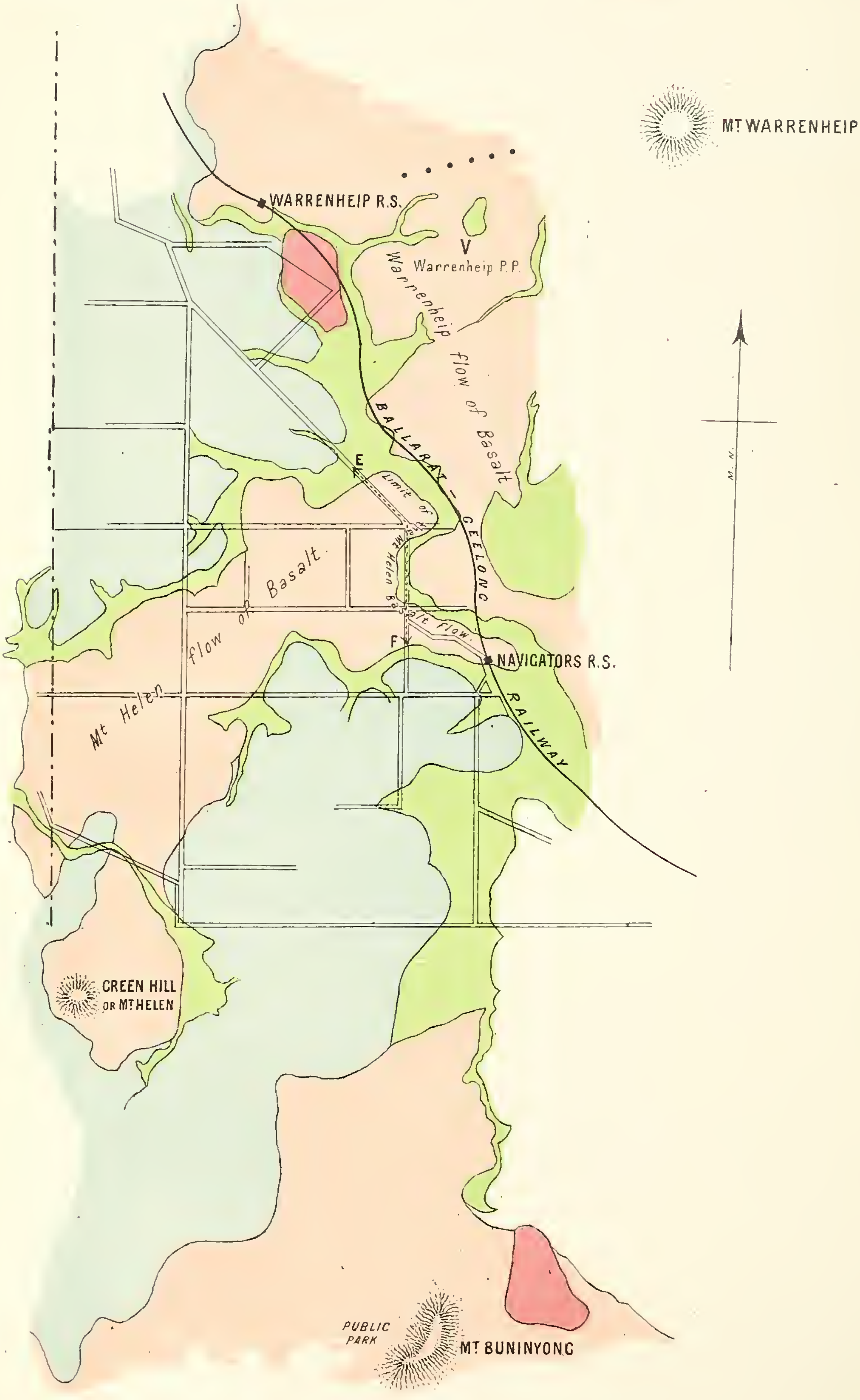
NATURAL HISTORY

Sketch Plan
SHOWING BASALT FLOWS
BETWEEN MTS WARRENHEIP AND BUNINYONG

Scale, 80 chains to One inch.

REFERENCE.

🟩 Recent
▨ Basalt
▨ Ordovician
🟥 Granite



Some 30 odd years ago a company was formed in Geelong to work the Cockatoo Line of Reef, and they drove an adit, about 550 feet in length from a small gully to the west of the lode, as shown on the accompanying plan, but they appear to have done nothing further.

The present syndicate have opened out a drive to the south at 512 feet from the mouth of this adit, on a formation of quartz which was 9 feet wide, and now shows in the face, at 90 feet, a width of about 5 feet. At this point they have begun to rise on the reef, which appears to be dipping about 50° to the east, while the strata (chiefly slates) immediately to the west of the lode are almost vertical. No section of the strata is obtainable beyond the reef as the cross-cut has been timbered up.

Prospects of gold were obtained near the cross-cut and in the face. The manager states that he is getting occasional prospects, but, as yet, nothing of a payable nature has been obtained.

From the information obtainable, there does not appear to be any justification for the assumption that saddle reefs are being worked. In the best exposed section of the Cockatoo Reef (in the old workings on the top of the spur), the reef is from 4 feet to 6 feet wide, and dips about 35° to the west. Its strike is N. 3° W. The strata dip 70° to the east. In the tunnel workings, almost immediately beneath, as shown on the plan and section, the reef apparently dips to the east, and the strata are almost vertical.

HIDDEN TREASURE MINE.

This claim, which is situated immediately to the north of the Star of the East, on Mount Misery Creek, has only been worked to a very limited extent.

A shaft was sunk to 49 feet, and a cross-cut driven 18 feet east. From it, I am informed, a crushing of 10 tons yielded 14 dwts. of free gold. At this stage the workings became flooded, and operations ceased.

[*Report sent in 23.9.05.*]

BORING SITES, MOUNTS BUNINYONG AND WARRENHEIP.

By W. Baragwanath, Junior.

Basalt from Mounts Buninyong and Warrenheip, and an intermediate point of eruption, known locally as Green Hill or Mount Helen, covers the greater portion of the country between Mounts Buninyong and Warrenheip, but strips of Ordovician strata border the flow to the east of Mount Helen. Absolutely nothing has been done to prove if there are deep leads, but the Mount Helen basalt takes a general easterly course between Ordovician strata of about the same present level. If, as suggested by Mr. Hunter, a line of bores were put down along the road near Navigators Railway Station, the existence of any lead from the west (which would be cutting across the general trend of the strata) would be proved within narrow limits. Should such work prove successful, further extensive boring would have to be done, as the basalt extends for 8 or 10 miles in an easterly direction.

Another point which cannot be settled from surface indications is the position of the head of the lead (if any) under this narrow strip of basalt. The present watershed being of volcanic origin gives no clue. To the north of Mount Warrenheip a number of craters and points of eruption entirely obscure any features that would serve to indicate a likely position for boring for a lead.

A line of five bores along the road marked E.F. on the attached plan should prove the deep ground. A few chains to the west the ground rises 50 feet, and the bores would probably be near the line of contact of the flow of basalt from Mount Helen with the more extensive flow from Mount Warrenheip.

[*Report sent in 16.11.05.*]

THE DAYLESFORD GOLD MINE.

By W. Baragwanath.

At the time of my survey of the Daylesford Gold Mine, work at the lower levels was suspended, and operations were confined to the upper or 303-ft. level. At this level, a drive upwards of 1,200 feet in length has been put in to the south. This drive for its entire length follows along a well-defined fault line with a westerly dip. Numerous spurs are associated with this fault, which in places assumes the form of a reef with one well-defined wall. A number of easterly cross-cuts were made, but nothing of any value was met with. To the east of this main fault line, another, and apparently a parallel line, has been driven on north and south from the cross-cut.

Northward along the level the drive follows the main fault line for a distance of over 600 feet. Numerous spurs with a westerly dip cut on to the fault line, and these have proved payable in places.

At the time of this survey, a spur from 18 inches up to 30 inches in width, and dipping 45° to the west, was being opened up in the northern end of the level.

In this level centre country shows at the shaft, but nothing has been done to prove whether there are any bodies of quartz along the extension of this axial line.

A cross-cut to the west of the shaft passed through strata dipping west for a distance of over 100 feet.

At the bottom level, the western cross-cut at 76 feet passed through a small vein of laminated quartz, which occurs along a fault line, and is from 6 to 8 inches wide. This vein also forms an eastern leg. At 80 feet from the shaft there is centre country, and at 98 feet a drive was put to the north for a distance of 90 feet along two well-defined legs, each carrying from 6 to 12 inches of nicely laminated quartz. Faulting appears to have taken place along these legs, one of which may prove to be the downward extension of the fault line driven on at the 303-ft. level.

At the end of the north drive, along the west leg, a short eastern cross-cut, driven to cut the eastern leg, met with a large body of quartz in the floor of the level. This appears to be the cap of a saddle reef, and a winze was sunk on it, but at the time of my survey this was full of water, and nothing could be ascertained as to the extent of the reef.

Further work on the centre country below this level is urgently required before anything in the way of permanency can be hoped for. The spurs in the eastern country, from which payable yields have from time to time been obtained, are irregular and of limited extent. The sinking of a centre country winze below the level would develop this portion of the mine.

A long cross-cut to the west passed through two dykes, one at 120 feet and the other at 312 feet from the shaft. At 400 feet there is a synclinal fold, and the country at this point is broken by the intersection of a dyke along a cross-course. Then, as far as the face at 516 feet, the strata dipped easterly.

From the survey it is apparent that the work in this mine has hitherto been confined almost exclusively to spurs. These, while at times rich, have not proved to be payable throughout, owing to the irregular nature of their formation and distribution. Although no evidence was obtainable, it is quite likely that certain belts of strata contain more auriferous veins than others, and were this proved, work could be confined to these belts.

The centre country should certainly be prospected, as the occurrence of well-defined legs at the lower level proves the existence of formations similar to those so extensively worked at Bendigo.

[*Report sent in 18.11.05.*]

MULROONEY'S LEASE, JUBILEE LAKE COMPANY, DAYLESFORD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The country rock consists of Ordovician slate and sandstone of grey colour. Strike about N. 10° W., dip E. A shaft has been sunk 30 feet deep, at a distance of about 6 chains in a southerly direction from the mineral spring. About 1 chain west of the shaft a large outcrop of quartz is exposed, in which a little gold exists. Strike of this reef, N. 10° W., the same as the country-rock, dip about 40° west. The reef cuts right across the bedding planes of the country. It has been worked by a shaft further south, and some crushings have been taken out. The reef is traceable for many chains southward from where previously worked; but it runs through private property. About 2½ chains south-west from the spring the country dips west 70°.

Alluvial workings extend over the shallow flat, in which the mineral spring occurs and up this line of reef; in one spot the alluvial gold has been traced beyond the line of this reef. The southern shaft is 80 feet deep.

This area has been applied for as a mining lease, but the mineral spring would be endangered by mining operations in such close proximity to it.

[*Report sent in 26.11.06.*]

THE AJAX MINE, DAYLESFORD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This mine is situated about 1 mile to the north-west of the town. The country rock consists of grey sandstone and slate. Strike, about N. 20° W.

A shaft, 11 feet by 4 feet, has been sunk at this mine to a total depth of 386 feet, and there are three levels: No. 1 at 220 feet, No. 2 at 300 feet, and No. 3 at 380 feet.

At No. 2 level the country rock dips east 55°. The lode which is similar in character to the Cornish Lode, dips west at 52°, cutting right across the bedding planes of the rocks. In strike the lode appears to correspond with the strike of the beds, or, in other words, the lode appears to have formed in a strike fault. The thickness of the lode ranges from 1 to 3 feet. The pitch of the lode and of the beds is south 7°. This lode has been stoped for a length of 330 feet on this level, and overhead to the level above. A cross-cut has been driven east from this level for 300 feet to the old Ajax Reef. This lode dips east at 70°, and cuts right across the beds which here dip west. The lode is said to have averaged about 3 feet in thickness. Several likely looking "walls" were cut in this cross-cut, but they have not been driven along. Two rises connect this level with No. 1 level.

In No. 3, or the bottom level, the country dips east at 50°. A cross-cut is driven diagonally across the country for a distance of 124 feet, so as to cut the lode where the shoot of gold from No. 2 level comes in. The distance of the lode (at right angles to the strike of the beds) from the shaft would be about 90 feet. The lode is exposed at the end of the cross-cut, and shows about 2 feet of quartz, &c. The quartz is seamed with sulphides in parts, and shows free gold, so that the shoot worked at the No. 2 level continues apparently down to No. 3 level, and goes underfoot. Just at this point the lode is somewhat disturbed.

This mine is only at the commencement of its career, and sinking operations should be vigorously undertaken to open deeper levels. A deep shaft on a mine is as good as a reserve fund, if it is sunk into a productive zone.

[*Report sent in 26.11.06.*]

THE PLAN OF THE ANTICLINES AT BENDIGO.

By E. J. Dunn, F.G.S., Director, Geological Survey.

In carrying out the extensions of the anticlines southward from the block already surveyed, Mr. H. S. Whitelaw has found that they take a strong sweep to the westward. To such an extent does this condition prevail that the Deborah Line in 3 miles has swung a distance of 33 chains more to the west than it would have been if the normal course of the anticline had continued. The method formerly adopted for tracing out the lines of reefs was to take a sight along the portion already worked, and then to prolong the line and open out on this extension. In the case of the Deborah Line the utter futility of such a method is well illustrated. The only reliable method of tracing out the anticlines is that now adopted by the Geological Survey.

LONGITUDINAL SECTION, HUSTLER'S LINE.

A very valuable piece of work is being carried out at Bendigo in producing the line of pitch through all the mines working on the Hustler's Line. The extension of the lines of pitch through all the lines of reef is of the utmost value in practical mining operations.

As a result of the work done along the Hustler's Line, it becomes evident that Thomson's Reef, which in the Great Extended Hustler's Mine alone yielded £360,000 worth of gold, pitches northward to such a degree that, although it was only 170 feet below the surface in the Imperial Hustlers Mine, at the United Hustler's and Rider Mine (6,070 feet further to the north) Thomson's Reef is almost 2,120 feet below the surface. Where Hustler's Line is being sunk on at the Hustler's Consols Mine, the saddle reef known as Thomson's Reef will probably be met with at a depth of 2,300 feet, always supposing the pitch to continue northward at the same rate. Still further northward the pitch rises to the north, and the lower strata again come nearer the surface, and also any saddle reefs contained in them.

The most suitable site for a shaft has to be chosen with an eye to two prime considerations:—1st. The shaft should be as near the crest of the anticline as circumstances allow, so as to explore the deeper beds with the least amount of sinking, so that, as regards dip, the shaft should be as near the apex of the fold as possible. 2nd. The shaft must be placed where the highest point of the pitch occurs, that is to say, where the lowest beds are exposed at the surface. The theoretical ideal position for a shaft is where the pitch falls away from a point to both north and south, and where the beds dip away from this point both to east and west, or, in fact, where what is known as a "crown" by the Bendigo miners exists. From such a point the beds dip away in all directions.

[*Report sent in 14.11.06.*]

THE NORFOLK REEF, KANGAROO FLAT.

By H. S. Whitelaw.

The workings on the Norfolk Reef are situated between the Thistle and Christmas anticlinal axial lines, 1¼ miles south-east of Kangaroo Flat township.

According to information given to me by the projectors of the enterprise, the Norfolk Reef was first opened by a German party about the year 1876, when phenomenally rich quartz was found on the surface, and afterwards worked with highly payable results for hundreds of feet north and south, and to over a hundred feet in depth. The early history of the workings is somewhat obscure, and there is an absence of trustworthy statistics; but there is every reason to believe that up to the time the reef was secured by the present holders (Messrs. Buttrey) the crushings from it compared favorably with the shallow level returns from most of the well-established mines now working in the central portion of the Bendigo field. This remark is apparently borne out by the extensive workings on the lease, and by statements made to me by several old miners whom I have questioned and who have spent most of their lives in the locality. They speak of crushings as high as 60 ozs. to the ton.

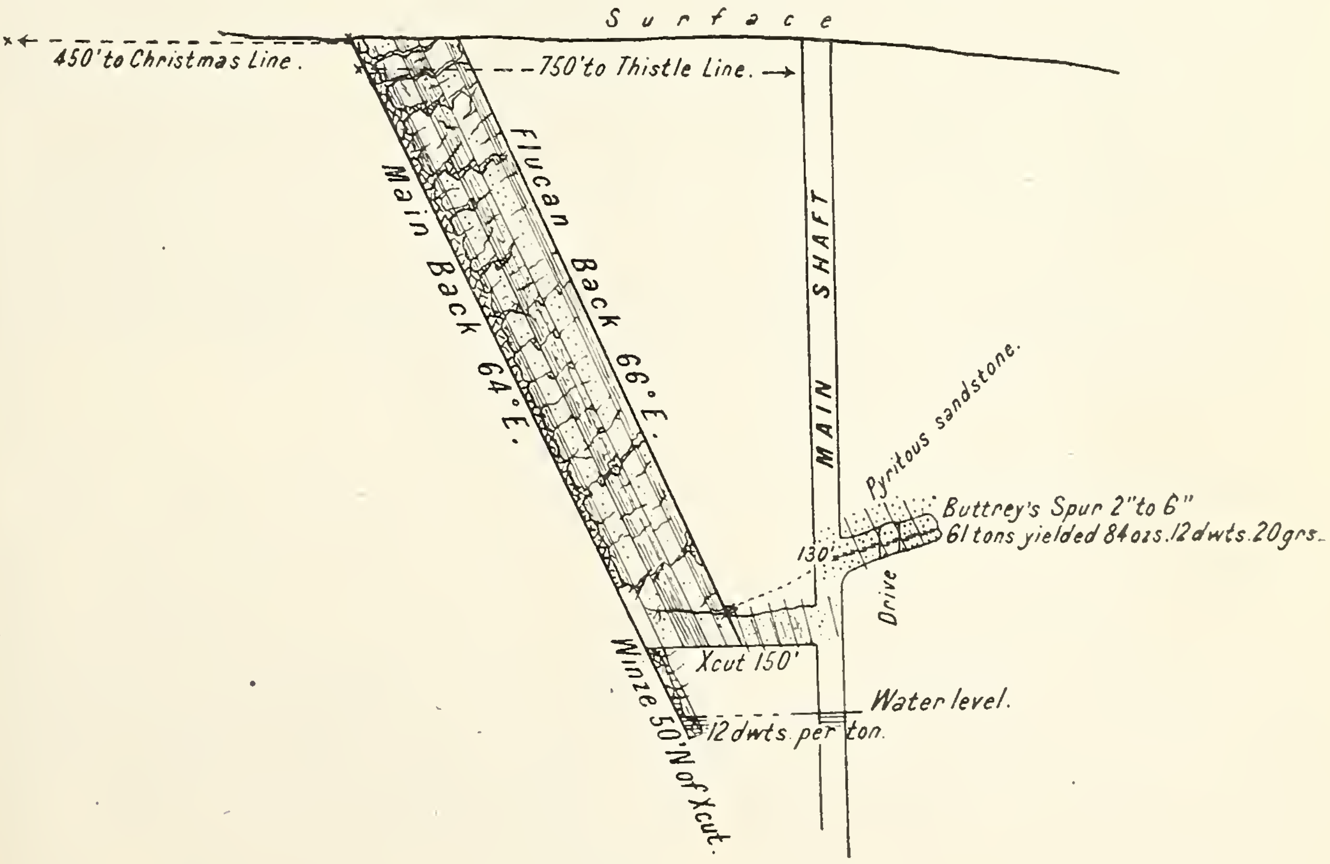


FIG. 34.
Sketch Section: Scale, 80 ft. to 1 in

The accessible workings on the lease are on two well-marked backs in the east limb of the Christmas anticline, and on " flat " spurs making away from these backs. The back nearer to centre country—that is, the western as regards position—carries a well-formed east leg 6 inches to 3 feet in width, which is auriferous wherever it has been tried; the other—26 feet further east on the surface—is also well defined, but, excepting where spurs make on it, carries no quartz. The former is known as the " leader " or " main " back, the latter as the " flucan " back. Practically the whole of the old workings are on flat spurs filling fracture planes between these two backs, and traversing the strata generally in a horizontal direction. These spurs occur at irregular intervals, and have no uniform size, but their occurrence has hitherto been frequent enough to yield a good profit, and it is confidently expected by the promotors that with depth they will be found to continue. The work of the present holders has been performed on the main back at 150 feet below the surface, and a flat spur (at 130 feet) dipping from the east towards the flucan back (see sketch). This spur varied in thickness from 2 inches to 6 inches. It has been worked on the underlay (23° west) to a height in places of 20 feet, and horizontally for about 70 feet. Bank returns handed to me showed that 64 tons crushed from it yielded 84 oz. 12 dwt. 20 gr. From observations made in the workings on this spur, and from remarks passed by the Messrs. Buttrey, it is evident that the character of the quartz was closely connected with the nature of the rocks through which it cut. The gold was not in payable quantity where the quartz intersected the normal sandstones, but was uniformly payable in a bleached, coarse-grained sandstone, containing innumerable decomposed coarse cubes of iron pyrites, and was rich at the intersection of thin bands of olive-green slate. These peculiarities, the miners state, were characteristic of all the spurs worked. On the main back, at 150 feet deep, and 43 feet west of the main shaft, a level has been driven southward, and although the leg was auriferous (crushings were nine loads for 1 oz. 12 dwt., and six loads for 1 oz. 16 dwt. 6 gr.), it was evident that the continuation of the main shoot in the old workings was not in this direction. A north level was then driven, and the shoot cut at about 40 feet north of the main cross-cut. At 50 feet north, a winze was sunk on payable quartz 3 feet wide, and crushings varying from 8 dwts. to 14 dwts. to the ton were broken from it (the last crushing from the bottom of the winze is said to have yielded 12 dwts. to the ton). At 27 feet down the winze water was struck, and work there discontinued. The main shaft was then deepened 50 feet, and the flucan back intersected. The water making from this back flooded the mine before the main back was reached.

It is now proposed to place a steam winch on the surface, cut down the main shaft, drain the mine, drive a cross-cut to the main back, and, in short, in place of the spasmodic efforts of development that have been made above water-level during the last few years, to systematically prospect for the continuation of the main shoot, as well as for another series of spurs below water-level. The prospects of success in working the deeper ground are good. The favorable beds in which the previously worked spurs were formed will, unless faulted, undoubtedly continue downwards until they are folded under the syncline between the Thistle and the Christmas lines. Down to this depth spurs may be expected to occur at intervals, and to be auriferous, though not so rich as those worked near the surface, the contents of which were probably augmented by a process of surface enrichment.

A promising feature noticeable in the specimens shown me from the deeper workings is that the gold is embedded in the solid stone, and not in flakes in the casing. Another favorable circumstance is that the Hope Mine, which operated in the same zone some hundreds of feet further north, worked payable quartz below water-level.

The venture is one to be encouraged in every way, as there can be no doubt that prosperity will sooner or later result from the efforts of legitimate enterprise in the proper development of the numerous quartz bodies which exist in the locality. The main shaft is well placed for the further testing of the deposits already discovered, but I would venture to recommend that attention be not wholly confined to these—that the formations in centre country (the Christmas Line) 460 feet west of the main back be also prospected. This line of reefs—the most westerly surveyed by the Mines Department—is not being worked anywhere on the field, although at different points, and more especially in the vicinity of Norfolk Reef, it would appear to have all the geological conditions favorable to the deposit of auriferous quartz.

[*Report sent in 12.3.06.*]

THE OCCURRENCE OF QUARTZ SPURS IN WATTLE GULLY, CHEWTON.

By E. J. Dunn, F.G.S., Director, Geological Survey.

On the north side of the Chewton to Castlemaine road, where it crosses Wattle Gully the Central Forest Creek dredge has bared the rocks. The alluvial ground removed was about 14 feet deep, and the rocks exposed consist of thick-bedded sandstone and slate beds. Strike of the country rocks, N. 15° W.; dip, 70° W. For a width of about 40 feet, quartz veins cut through the sandstone and slate beds in an irregular manner. The spurs are from 15 inches thick downwards, and they are much stained with iron oxide. The quartz, when broken, has a favorable appearance for gold, and contains iron pyrites and galena thickly disseminated through it. A trial crushing should be made of quartz obtained a few feet from the surface, as the surface stone may have particles of alluvial gold in the cracks and crevices.

The spurs extend right through the paddock for about 100 yards in length, and they should be properly prospected now that they are laid bare. The anticline passes three or four claims further to the east.

[*Report sent in 7.9.06.*]

THE GOLDEN TOP MINE, BULLENGAROOK, COUNTY OF BOURKE.

By Stanley B. Hunter.

The Golden Top Mine is situated on Scotty's (misnamed Goodman's) Creek, and about 1½ miles south-westward from Bullengarook. The surrounding country consists of steep to precipitous spurs and hills of brown sandstone, soft quartzite, and limited beds of mudstone and slate, all of Ordovician age. The strata have a persistent easterly dip for some distance east and west of the mine.

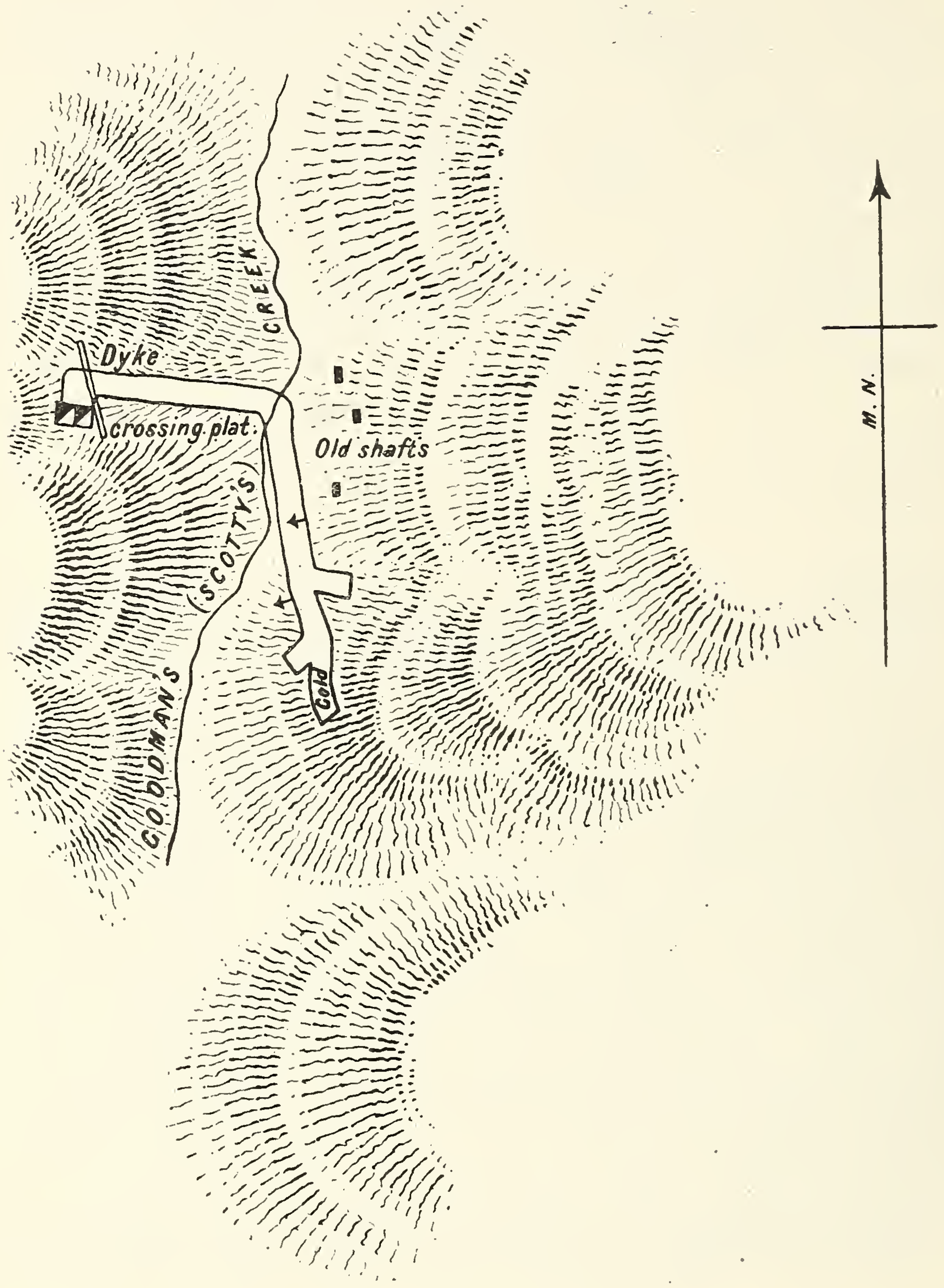
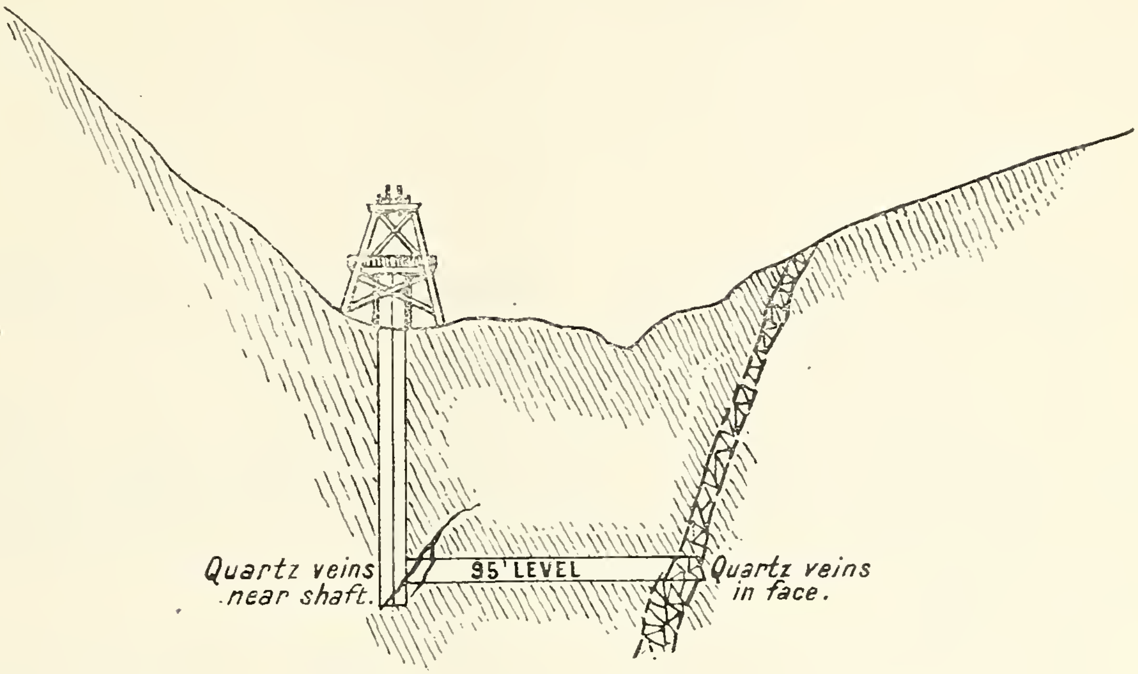


Fig. 35.

The shaft is a double compartment one, sunk to a depth of 95 feet from the collar, and the plant consists of small poppet heads, a light plunger pump, an 8 horse-power Simplex oil engine, and housing. Altogether, the present company has spent £1,300 in the purchase and erection of the above plant, in sinking the shaft, and in driving, as shown on the plan, but, unfortunately, nothing payable has yet been found, although the recent mining operations were started to trace a small but reputedly rich shoot worked in the early days.

A reef channel, in places up to 14 feet wide, has been formed between what are undoubtedly the walls of an extensive fault line. Quartz veins, segregations of quartz and black clayey material, all of which are more or less pyritic,* now occupy this channel; and there is every indication that further breaks occurred along and in the fault line subsequent to the formation of the quartz veins, as much of the quartz *in situ* shows clean fractures partly filled with a secondary deposit of pyrites.



Scale, 100 feet to 1 inch.

FIG. 36.

Auriferous quartz can be obtained only in a very narrow shoot, probably not more than 1 or 2 feet in length, the other portion of the quartz being barren. Along this limited shoot, auriferous quartz specimens can sometimes be obtained.

In my opinion, the fissure constituting the lode channel extends both vertically and horizontally for a very considerable distance, but whether the limited auriferous quartz within the channel will become more extensive in a downward direction can only be determined by mining operations.

One feature which must not be overlooked is that, owing to the surface fall and loss of level in driving, the further the drive is extended southward down stream, the nearer the face of the drive will approach the surface.

I do not think that any good purpose will be served by extending the workings northward, as no gold appears to have been found in the stream above, or to the northward of the mine; and should the company determine

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*Two samples of pyrites submitted for assay. They consisted of pyrites with a little slate and quartz, and gave the following results :—

—	Gold : per ton.			Silver : per ton.		
	ozs.	dwts.	grs.	ozs.	dwts.	grs.
No. 1	1	13	8	0	0	0
No. 2	4	6	5	0	3	22

to test the reef on its southern extension by sinking another shaft, considerable difficulties will occur owing to the steepness of the valley slopes, and this, coupled with the want of anything like a payable shoot of gold, renders the undertaking extremely speculative.

[*Report sent in 14.8.06.*]

THE COPPER LODE, MT. CAMEL, NEAR HEATHCOTE.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This newly-opened lode is situate about 12 miles north of Heathcote and about 1 mile W. 20 deg. N. from the Mt. Camel Homestead. It is, by aneroid measurement, 800 feet above sea-level. At this site, and for a considerable distance around, the country rock belongs to the remarkable Heathcotian system.

The lode is at the east foot of the Mt. Camel range, two or three hundred feet below the crests of the ridge. At the lode the rock is difficult to determine, but it appears to be a highly altered igneous species stained with oxides of iron and manganese. At the surface there was nothing to indicate that rich(1) copper ores existed within a foot or so below the surface.

On breaking into the friable cap, even for a few inches, stains of blue and green carbonates are very distinct.

The lode was first discovered about twenty years ago when a fence was erected, and in sinking a post-hole, stones were thrown out with the characteristic blue and green stains. A piece of this stone was kept, but nothing more was done until a short time ago when the site was re-located and a trench made on the north side of the fence. From this trench, which is about 9 feet long and 5 feet deep in the deepest part, rich carbonates of copper ore were obtained. At the bottom some red oxide of copper and, it is stated, branching films of native copper were found. It is remarkable that at so shallow a depth rich ores exist while on the undisturbed surface the rocks have been so thoroughly leached as to leave no clue to what exists below. Another trench has been cut close to, and on the south side of, the fence, and at 2 ft. 6 in. from the surface, I saw blue and green carbonates of copper.(2)

The two small trenches prove that the lode is at least 15 feet across, but how much wider it is remains to be proved. The strike of the lode appears to be about north and south. Parallel to it and 1 chain to the west, there are characteristic Heathcotian cherty beds, and about 2 chains further west is a very strong quartz lode, 30 or 40 feet thick, that runs southward for over a mile. It crosses the highest peak south of the copper trenches and it dips west at an angle of about 45 deg. In a gully still further south, a shaft was sunk many years ago on what is believed to be the same quartz lode, and rich silver assays were obtained from the mineral present in the quartz. In about the same line, but over a mile southward (1½ miles northward from the Junction Hotel) there are old workings where Mr. Mitchell, senior, over 30 years ago obtained auriferous quartz which he

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(1) Samples submitted by the Hon. G. Graham assayed 5 6 per cent. of copper.

(2) Samples obtained by me for assay gave—gold 8 grs. per ton, copper 1.5 per cent., iron 61.8 per cent.

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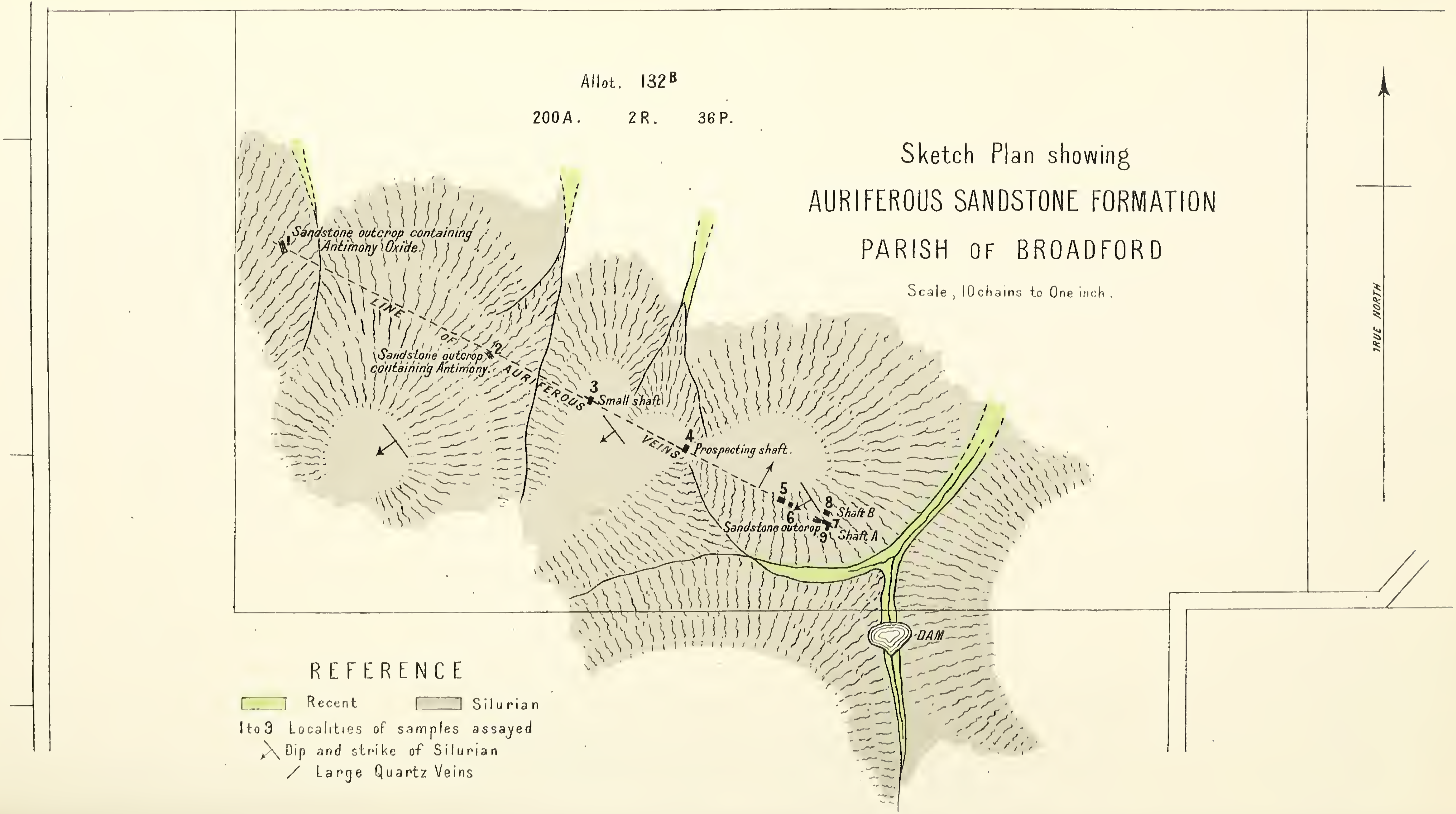


Sketch Plan showing

AURIFEROUS SANDSTONE FORMATION

PARISH OF BROADFORD

Scale, 10 chains to One inch.

crushed at a five-head battery and obtained a few pennyweights of gold per ton. The country rock in which both the silver ore and the gold-bearing quartz were found is Heathcotian (Pre-Ordovician).

Wherever the Heathcotian rocks have been examined they have been proved rich in metals and minerals of economic value, and from my knowledge of the country of the Mt. Camel range, I feel convinced that when this tract is properly prospected valuable discoveries will follow, the present copper discovery being an earnest of what is to be expected later on. Many years ago (about 1891) I traced these rocks northward for 40 miles to Lake Corop, but no detailed work has ever been done over most of the area. Heathcotian rocks are found from Heathcote to Tooborac and probably outcrop between Tooborac and Lancefield.

The absence of surface indications of copper and other minerals in lodes that are rich a few inches or feet below is remarkable and accounts for much. Though the Mt. Camel country is cleared, and for the last 50 years has been occupied and traversed in all directions, this copper lode might never have been discovered but for the sinking of a post-hole in it. There is a very wide expanse of country similar to that containing this lode, and, no doubt, there are many other lodes lying concealed in it that will require a most diligent and careful search if they are to be discovered.

Not only at Mt. Camel, but at Barnawartha and at many other places, there is doubtless this absence of surface indications of ores beneath. The most probable reason for this is, that in Victoria the rainfall is sufficient to leach out every vestige of stain, for in drier countries the presence of such ores as those of copper are conspicuously marked by extensive blue and green stains on the cap of the lode.

This absence of surface signs is baffling to prospectors and will entail much more careful work in searching for lodes than has hitherto been considered necessary. It is also probable that much more mineral wealth exists in the State than has been imagined.

If on further exploration the copper lode verifies its present promise it will lead to extensive search being made for miles around, where similar conditions prevail and perhaps result in other valuable discoveries in this unique tract of country.

The country has been pegged and leases applied for for a considerable distance north and south of the site already opened up by Mr. Herds and his party, whose energy may lead to the development of a new branch of mining industry in the State.

[*Report sent in 23.6.06.*]

CUNNINGHAM'S ANTIMONY LODE, TYAAK, BROADFORD.

By A. M. Howitt.

The antimony lode which is being worked on W. Cunningham's allotment No. 132^B, parish of Broadford, is situated to the north of Tyaak in the Reedy Creek district. It is about 5 miles from the nearest reefs now being worked, but departmental papers of the year 1895 show that a lease for quartz mining was held about 30 chains due east of Cunningham's mine at that date.

The auriferous makes occur in Silurian sedimentary rocks consisting of the following series :—

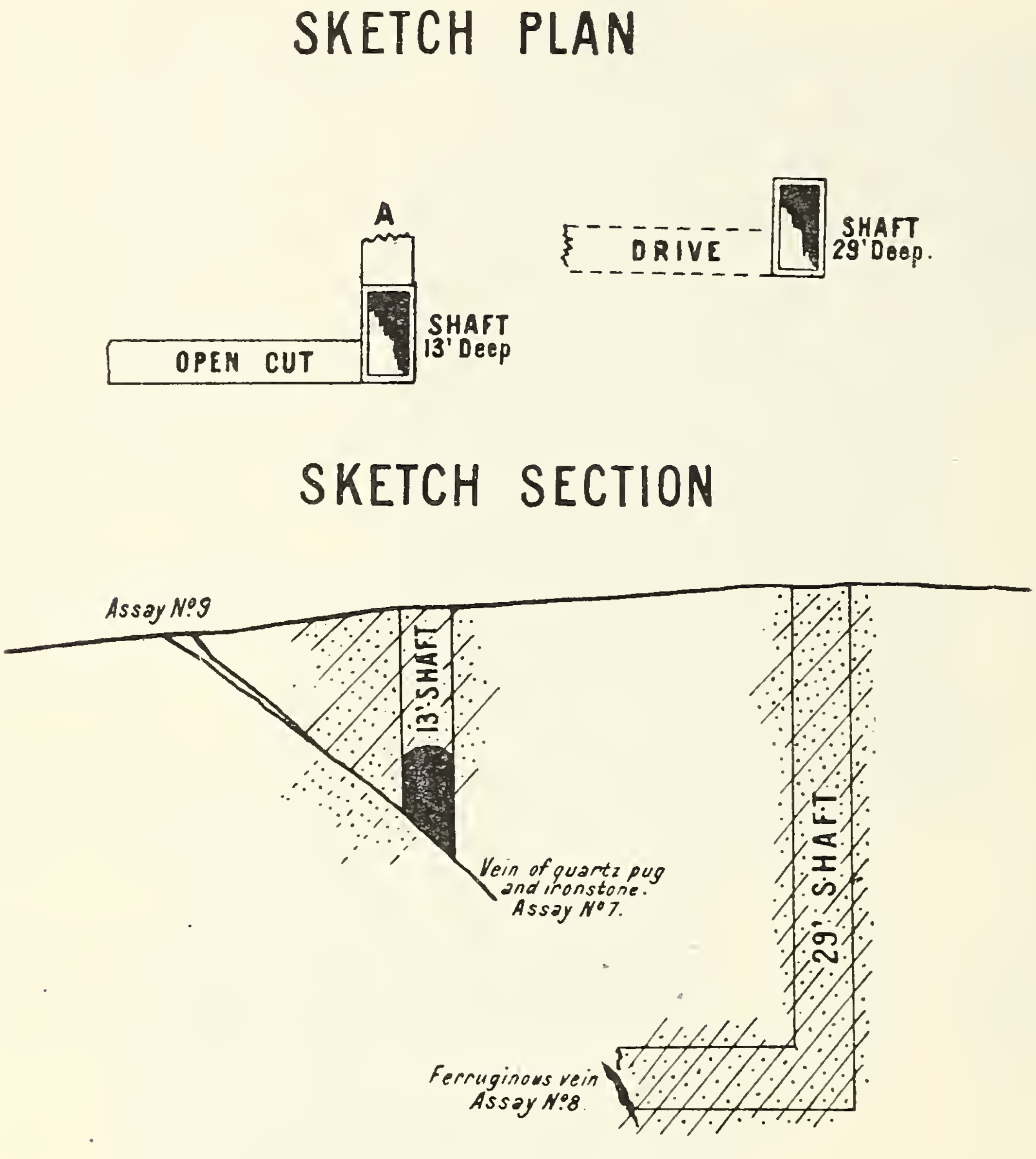
(1.) Grey indurated sandstones.

(2.) Soft brown micaceous sandstones with numerous ferruginous joint planes.

(3.) Soft fine blue-grey sandstones with occasional joints.

(4.) Crushed grey, red, and brown fine siliceous sandstones with numerous ferruginous joints; and blue-grey shales intersected by thread-like veins of quartz. This series of crushed beds contains antimony oxide. (Localities Nos. 1 and 2.)

The dip observed in the underground workings is 50 deg. to the south-west, and the strike observed at various points along the outcrops about N. 40 deg. W.

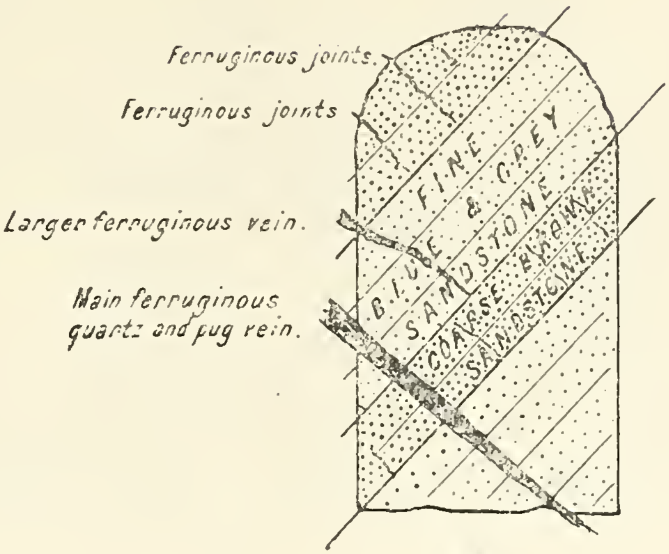


Scale, 20 chains to 1 inch.

FIG. 37.

The main work has been done on a cross-vein formation composed of quartz, ironstone, and pug, which the prospectors discovered about four months ago, and have since followed on its north-eastern underlay by means of an open cut. A vertical shaft was afterwards sunk to a depth of 13 feet to connect with the open cut, and at this level the formation bulged to over 1 foot in width, including 4 inches of quartz; but where now seen in the north-western face the vein is small. (See fig. 37.)

To intersect the vein at a lower level, a vertical shaft was sunk at a point 24 feet north-east of the 13-ft shaft, and at the depth of 29 feet a cross-cut was driven 15 feet in a south-westerly direction, where it cut a small ferruginous faulted vein, apparently the downward continuation of the vein worked above.



A

(See plan)

Approximate section in face of 13' shaft, showing how cross veins and ferruginous joints terminate at certain beds.

FIG. 38.

As indicated in section, fig. 38, the coarser sandstones are full of ferruginous joints and veins which terminate or thin out at certain beds. This fact looks unfavorable to the downward continuation of the main cross vein for any considerable distance, but the bulged portion of the vein has a north-westerly pitch and may continue in that direction.

Mr. Cunningham informs me that more work will be done on the pitch of the stone.

The following assays are from the main vein :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.			Silver per ton.			Antimony.
			ozs.	dwts.	grs.	ozs.	dwts.	grs.	percentage.
7	411A	Ferruginous casing, quartz and pug	0	14	0	0	0	13	3·1
	411B	Quartz	0	8	18	0	0	13	0·5
8	412	Quartz, ironstone, and pug formation	0	10	2	0	1	8	1·2
9	413	Broken ferruginous quartz and sandstone	2	0	12	0	1	9	4·3

ADDITIONAL PROSPECTING.

LOCALITY NO. 1.—Good prospects of flour gold were obtained by loaming near a surface outcrop 2 chains south-east of the western boundary fence of allotment No. 132B. No work has been done on this outcrop, but I procured specimens showing white lenticular patches which proved on blow-pipe examination to be antimony oxide, although Messrs. Cunningham informed me that they knew of no occurrences of antimony ore on their ground.

The following assays are from locality No. 1 :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver per ton.	Antimony.
			ozs. dwts. grs.	ozs. dwts. grs.	percentage.
1	402	Fine sandstone and shale crushed. Thread quartz veins and antimony	0 10 10	1 1 5	4·7
1A	403	Do.	0 9 18	0 7 19	3·3

Further prospecting is advisable, and more assays should be taken from this formation.

Locality No. 2.—Fourteen chains to the south-east of locality No. 1, an outcrop of similar crushed siliceous sandstone and shale occurs. Here the antimony oxide is again seen in lenticular patches, and on joint faces. No work has been done here, and the outcrop is favorable to further prospecting.

Assays gave as follows :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver. per ton.	Antimony.
			ozs. dwts. grs.	ozs. dwts. grs.	percentage.
2	404	Fine crushed sandstone and shale. Thread quartz veins and antimony	0 8 3	0 3 2	9·7

Locality No. 3.—Six chains to the south-east of locality No. 2, a prospecting shaft has been sunk about 6 feet on a quartz vein, with a ferruginous casing occurring in coarse ferruginous micaceous sandstone and thin beds of greenish slate. It is unlike the crushed auriferous beds containing the visible antimony oxide.

Two assays yielded as follows :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver per ton.	Antimony.
			ozs. dwts. grs.	ozs. dwts. grs.	percentage.
3	405	Quartz	0 4 14	0 1 5	1·5
3A	406	Ferruginous reef formation	0 0 20	0 0 9	1·7

Locality No. 4.—Six chains south-east of locality No. 3, a prospecting shaft has been sunk for 6 feet in another outcrop of brown crushed siliceous sandstone, grey shale, and ironstone, but as the shaft was full of water, no examination could be made.

An assay yielded as follows :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver per ton.	Antimony.
			ozs. dwts. grs.	ozs. dwts. grs.	percentage.
4	407	Ferruginous fine sandstone and shale, with thread quartz veins	0 8 3	0 1 4	9·1

LOCALITY No. 5.—Six chains south-east of locality No. 4, a small prospecting cut has been put in across a crushed siliceous sandstone and grey shale formation.

An assay yielded :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver per ton.	Antimony.
			ozs. dwts. grs.	ozs. dwts. grs.	percentage.
5	408	Ferruginous quartz and sandstone	0 5 21	0 0 5	0·4

LOCALITY No. 6 is situated 1 chain south-east of locality No. 5, and 2 chains north-west of the main workings. No work has been done on this outcrop, from which the original assay No. 427 was obtained.

Assays :—

Field No. of Specimen.	Assay No. of Specimen.	Description.	Gold per ton.	Silver per ton.	Antimony.
			ozs. dwts grs.	ozs. dwts. grs.	percentage.
Original sample	247	Ferruginous and siliceous sandstone	0 7 19	0 0 0	0
6 (check sample)	409	Do.	0 7 4	0 0 9	2·2
6A	410	Ironstone and ferruginous, siliceous sandstone	0 14 8	0 1 16	0·4

The assay samples were obtained from a regular line nearly half-a-mile long, but there is not sufficient evidence to be obtained from the prospecting holes and the small exposed outcrops to show whether this is one continuous cross formation. The majority of the veins, whether quartz or ironstone, cross the beds at all angles, and possibly these gold deposits are on a line of disturbance along which minor fracturing and fissuring has occurred, when crossing certain beds, as the crushed siliceous sandstone and shale, but the several outcrops must be further prospected before a definite opinion can be expressed. Seven of the assays (Nos. 1, 1a, 2, 4, 5, 6, 6a) from similar formations give an average of gold, 9 dwt. 2½ gr.; and silver, 5 dwt. 1 gr., per ton, and 4¼ per cent. of antimony. The width of the auriferous formations would average approximately 1 foot. I consider localities Nos. 1 and 2 well worth further prospecting, and more assays should be taken from them. Mr. Bayly, of the departmental laboratory, made the assays, and suggests further experimental work with a view to testing the amenability of these ores to treatment by cyanide, in order to determine their economic value.

[*Report sent in 21.7.04.*]

On a later visit, accompanied by Mr. Cunningham, I proceeded to locality No. 2 (referred to in my first report); and whilst removing the loose surface and more decomposed rock, at a depth of about 15 inches, a well-defined cross vein of solid stibnite was exposed trending across the strata, with a bearing of E. 20 deg. S., and nearly vertical. It can now be seen that this vein consists of stibnite about 2 inches wide, with a casing of oxide of antimony. The crushed siliceous sandstone and shale formation which it cuts is here and there marked by lenticular patches of antimony oxide. The strike of the beds is N. 40 deg. W., but the angle of dip could not be taken. I was unable to determine the width of the whole antimony-bearing formation, but may state it as approximately 2 feet. A dish prospect from this solid antimony sulphide yielded several colours of free gold, one fairly coarse. It is possible that other solid sibnite may be cut, and seeing that there has been nothing done here as yet, Messrs. Cunningham have a chance of opening up antimony ore, which might easily have been overlooked had not an officer of the Mines Department visited their claim.

[*Report sent in 29.7.04.*]

FURTHER NOTES ON ANTIMONY ORE AT TYAAK.

By Stanley Hunter.

Mining operations are being carried out on an antimony lode situated in the south-western half of allotment No. 132B, parish of Broadford, and about 4½ miles a little north of east from Broadford township, at an altitude of 1,180 feet above sea-level.

The surrounding country is undulating to steep, and the uncultivated portion is lightly timbered with box and gum saplings.

The mine is comparatively easy of access, except in midwinter, when the heavy roads would preclude transport of machinery.

The rocks are Silurian, and consist chiefly of mudstones and sandy shales, with bands of sandstone at irregular intervals. The strike varies from N. 28 deg. W. to N. 36 deg. W., with a regular dip at the mine of 55 deg. to the west.

The lode has been traced by shallow prospecting holes and trenches for a total distance of about 60 chains, and has an average strike of W. 20 deg. N., with a northerly dip of from 70 deg. to 75 deg. The width of the lode formation from wall to wall varies from 2 feet down to 6 inches, and the average might be estimated at about 14 inches. Almost invariably that portion of the lode containing most antimony, either as a sulphide or oxide, is from 4 inches to 6 inches wide, and is on the footwall. I was informed by Mr. Cunningham that at the eastern end of the formation, as far as it is traced, the gold value per ton increases, and the antimony value decreases; and that the contrary occurs at the western end.

At the bottom of the shaft there are short drives, 16 feet west and 12 feet east on the lode formation. The lode was again opened 45 feet south of the main shaft, and at the bottom level it crosses the shaft, the dip here being 75 deg. north, and the strike W. 21 deg. N.

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NATURAL HISTORY

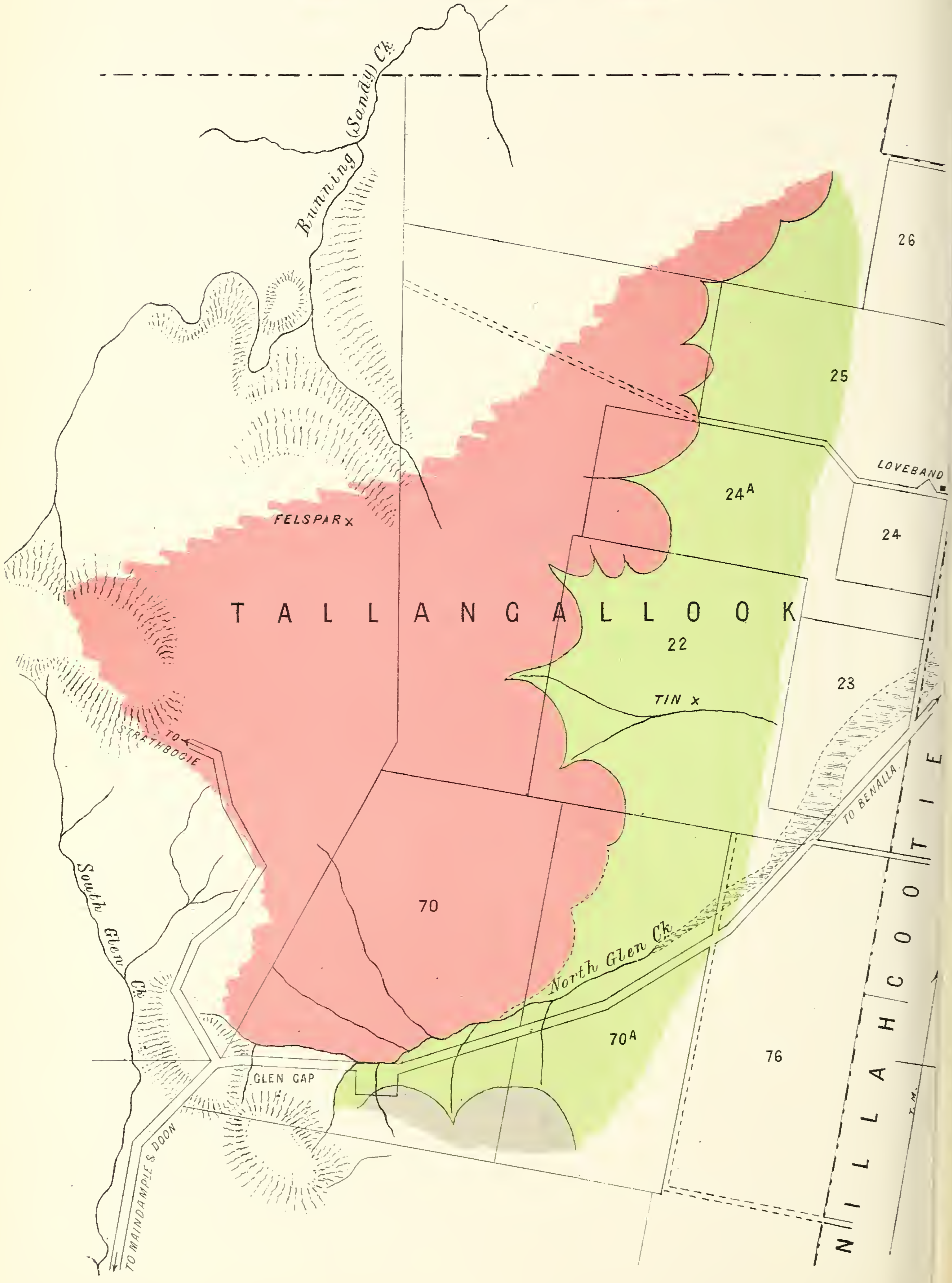
Sketch Plan of

TALLANGALLOOK

Scale, 40 chains to One inch

REFERENCE

🟩 Recent ▨ Silurian 🟥 Granite



In the western face a small "horse" of mudstone, 18 inches wide, occurs, the main portion of the lode resting on the footwall. Traversing the "horse" there are thin veins of antimony oxide. From wall to wall the lode is 2 feet 1 inch in width.

In the eastern face the lode is 18 inches wide, and has a more permanent appearance. Samples taken from these faces are submitted for assay.[1] The origin of this lode is unquestionably due to an extensive east and west fault line, and, from the appearance of the walls of the fissure, I am inclined to think that the downward displacement of the rock mass on the northern side will not exceed a few feet, possibly not more than 15 to 20 feet, but as there is more or less curving in the fault plane, a series of lenticular deposits, alternating with narrower veins, is seen.

There is but little doubt that this fissure will continue to a very considerable depth, but whether the antimony ore will be found in payable quantities can only be determined by actual test.

I am satisfied, however, that the locality has sufficiently good prospects to warrant an exhaustive trial being made. Bulk assays of not less than half-a-ton each will give the best results in such work.

[*Report sent in 29.7.05.*]

ORTHOCLASE FELSPAR AND CASSITERITE IN THE PARISH OF TALLANGALLOOK, COUNTY OF DELATITE.

By A. M. Howitt.

ORTHOCLASE.

The rock in the vicinity of the massive orthoclase is a granite composed of quartz, orthoclase and biotite, in which are some large orthoclase crystals with small included flakes of mica. The sample of massive orthoclase forwarded to the Department (No. 205) is from the surface, and has been somewhat discoloured by exposure to the weather and to bush fires.

The surface soil obscures the granite, and only loose samples of massive orthoclase can be seen, but I have no doubt that a considerable quantity occurs, either as a lenticular patch of massive orthoclase, or as a coarse crystalline dyke in the granite. The outcrop is 8 miles north of the Maindample Railway Station. The road is fairly good, and after passing the Glen Gap has a down grade the whole way. Timber and water are plentiful.

The following report on the sample was made by Mr. P. G. W. Bayly, of the departmental laboratory :—

No analysis was made of this sample. It is a massive formation, white to dirty brown in colour. Five tests were made to determine its utility with respect to pottery work. At a temperature of about 1,400 deg. C. it fused down entirely to a fine white opaque mass. The various

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(1) The following are the results of the assays :—

Average sample, west face, bottom level. Mudstone showing a little antimony oxide :—Gold, per ton, 6 dwts. 8 grs. ; silver, trace ; antimony, 2.27 per cent.

Same position, material on footwall :—Gold, per ton, 8 dwts. 19 grs. ; silver, 2 dwts. 8 grs antimony, 8.64 per cent.

Average sample from east face :—Gold, trace ; silver, nil ; antimony, nil.

portions were taken separately—(1) whitish; (2) brownish; (3) bulk sample. The resulting mass is precisely the same in appearance as that obtained from a similar test on imported felspar. The test shows that it could be made directly marketable, as almost all the sample could be utilized.

The American production is as follows:—

	Short tons.	Value (dollars).	Value per short ton. £	s.	d.
1905	35,419	226,157	1	6	0
1906	72,656	401,531	1	2	6

If this deposit is extensive it should be examined and reported on in full. With any development of the pottery industry an extensive body of felspar at all like this sample would be of direct commercial value.

The conditions of good workable felspar are that it should be practically free from iron oxide, mica, and quartz. It is used as a glaze for chinaware and tiles, in the manufacture of certain varieties of glass, and in soap manufacture. The principal use is for white earthenware or porcelain.

CASSITERITE.

In the course of my work on Quarter-sheet 45 N.E. (New Series), in the Mansfield district, Mr. Wilson, of Glen Creek, Nillahcootie, showed me some samples of black minerals which he had obtained in allotment 22, parish of Tallangallook, whilst prospecting for gold last year. A blow-pipe examination showed them to be tourmaline and cassiterite. One grain of cassiterite was as large as a pea. The tin was found in an alluvial deposit composed of granite drift, granite boulders, quartz wash, and consolidated granite detritus at no great distance from the granite outcrop, in which the massive felspar was observed (see map). Mr. Wilson informed me that he never saw bed-rock, nor did I when I examined the place, and can therefore only furnish a section showing about 20 feet of granite drift covering a heavy wash of granite and quartz boulders. Several prospects from the face failed to give any trace of tinstone, but these prospects came from the headings near the top of the boulder wash.

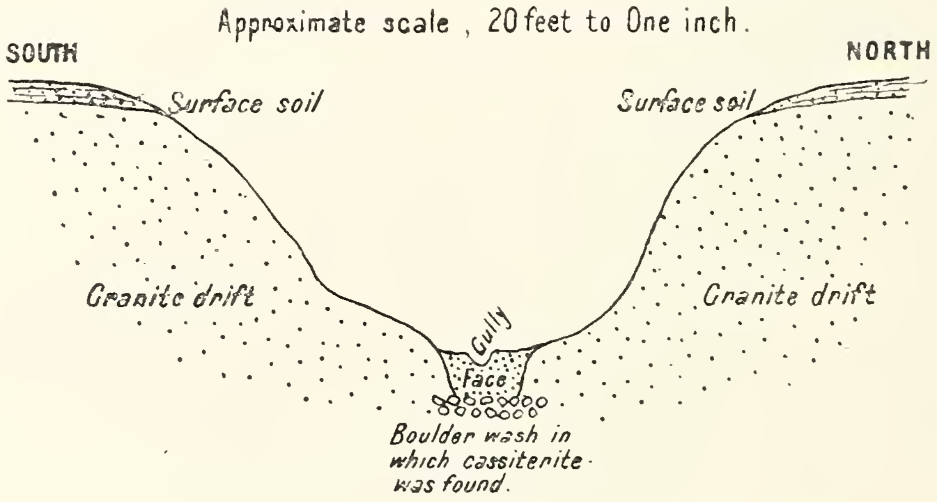
Approximate scale, 20 feet to One inch.
SOUTH
NORTH
Surface soil
Surface soil
Granite drift
Granite drift
Gully
Face
Boulder wash in which cassiterite was found.

FIG. 39.

There is a large area of granitic detritus similar to that shown in the section, and none of it has been prospected for tin.

[*Report sent in 9.4.05.*]

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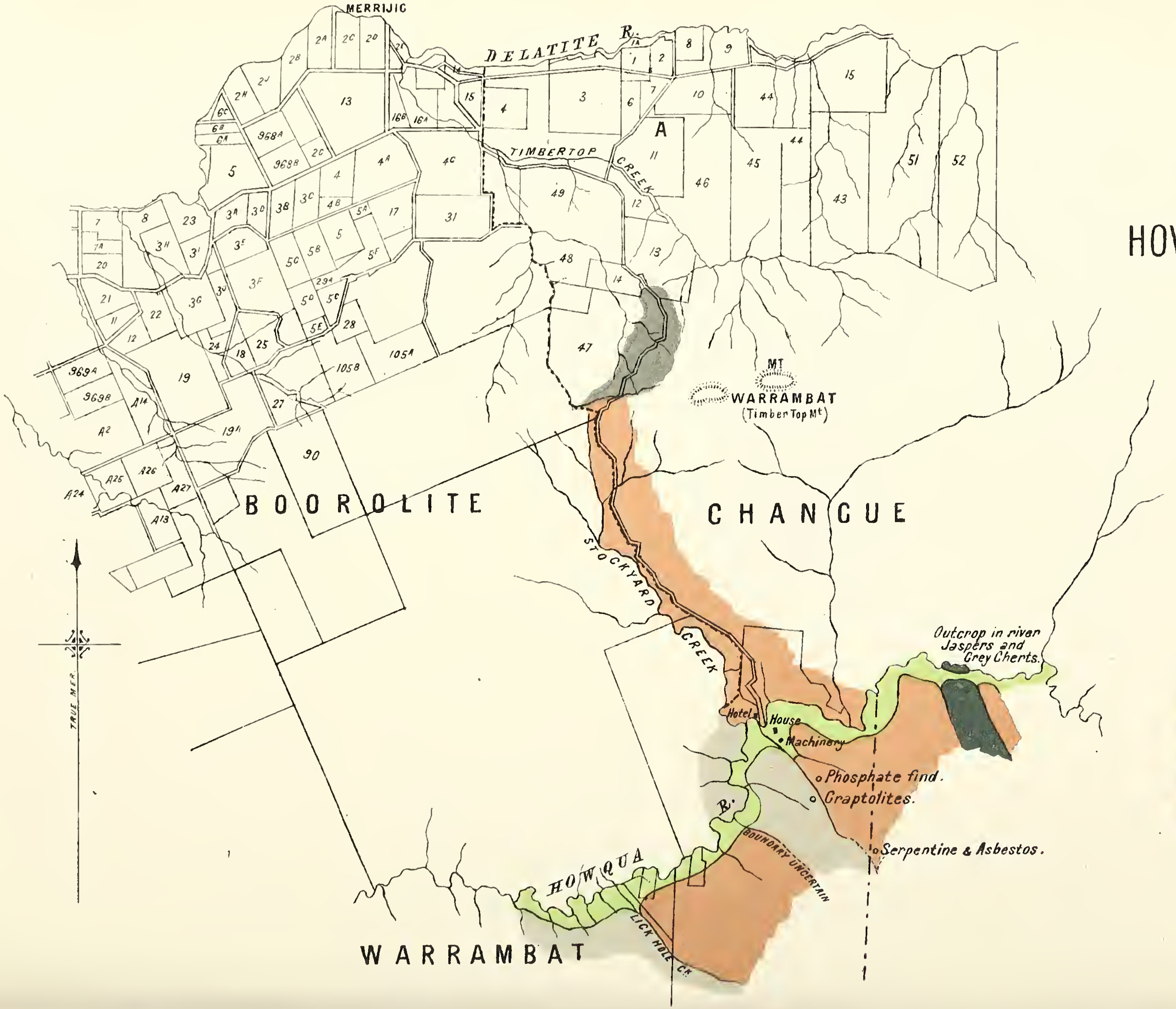
PLATE XXIII



GEOLOGICAL SKETCH PLAN
HOWQUA RIVER. PHOSPHATES Etc.
(Near Great Rand Mine)

Scale, 2 Miles to One inch.

REFERENCE

- 🟩 RECENT (River flats).
- ▨ CARBONIFEROUS (Conglomerate, Sandstone & Mudstones).
- ☐ SILURIAN (Slates & Sandstone).
- ■ CAMBRIAN? (Cherts & Jaspers).
- 🟧 AMPHIBOLITES & HORNBLENDIC ROCKS.

REPORT ON ALLEGED DISCOVERY OF PHOSPHATE OF ALUMINA NEAR THE GREAT RAND MINE, HOWQUA RIVER, COUNTY OF WANNANGATTA.

By A. M. Howitt.

Specimens of a rock from near the Great Rand Mine, Howqua River, were analyzed by the Department of Mines, and found to contain about 15 per cent. of phosphoric anhydride in combination with alumina, &c. Mr. Jennings, who found the specimens, informed me that he was led to the discovery by observing the similarity of some of the Flannery's Hill phosphates to some rocks he had once seen near the mine.

At the Great Rand Mine I found that the loose specimens had been picked up on the side of a gully about 45 chains south-east of the manager's quarters, and that a trench had been cut which failed to expose any phosphatic rock, or the beds usually associated with it. The rock near the find is an intrusive amphibolite, and on the western side of the gully there are outcrops of blue slates, sandstones, and a crushed formation of slate and quartz, from which I obtained a graptolite (*Monograptus*), which indicates that the slates are Silurian.

Southwards on the range, and at the head of the gully, I could see no fresh formations, but noted that the amphibolites, being very rich in hornblende, have been converted into serpentine, and at one point contain asbestos veins.

As there was nothing to indicate where the phosphatic rock could have come from, my examination had so far proved unsatisfactory; and I formed the opinion that the specimens had been carried to camp by some prospector or miner in the past.

I described the cherts associated with the phosphates at Mansfield and Tatong to Messrs. Fry and Jennings, and they remembered having seen such rocks further east along the Howqua River, so, in their company, I went there, and about 1¼ miles eastwards found that the amphibolites contained an occasional included block of chert. Twenty chains further on coloured cherts and jaspers with chalcedonic veins (as at Tatong) can be seen. They are about 25 chains wide, and outcrop in the river-bed. On the eastern side of the cherts the amphibolites occur again, and again contain included chert blocks near the contact.

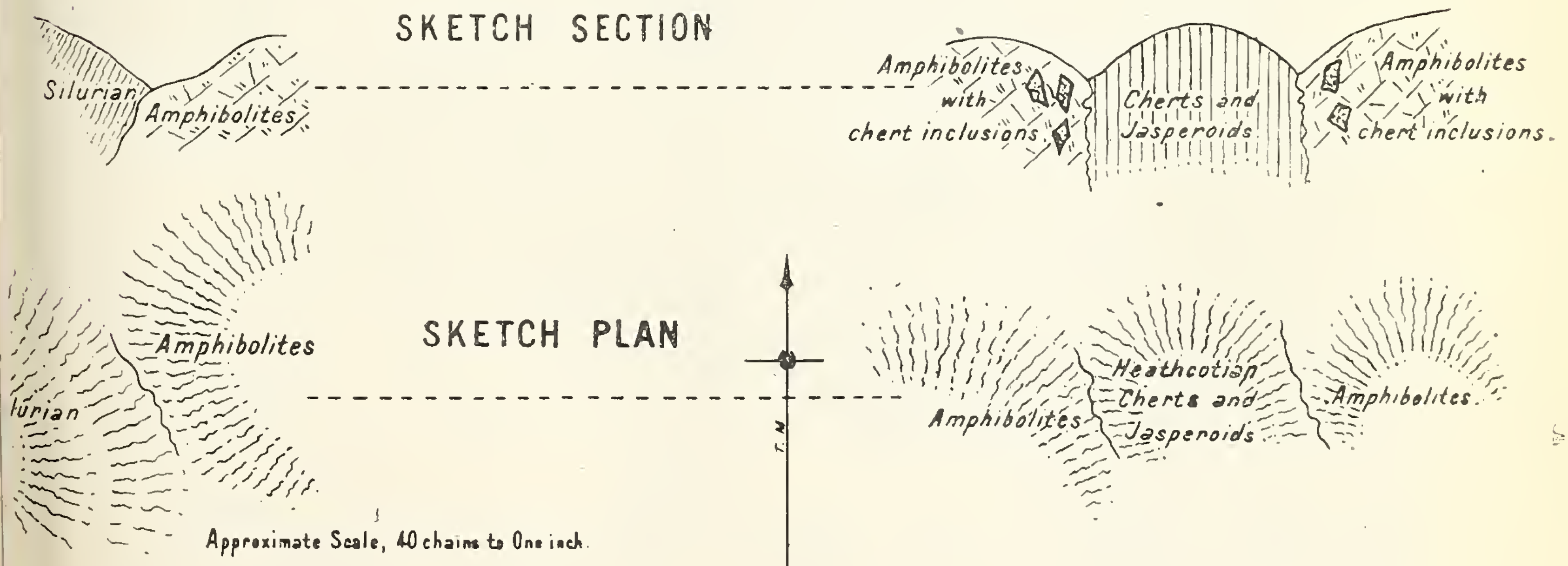

SKETCH SECTION
Silurian
Amphibolites
Amphibolites with chert inclusions
Cherts and Jasperoids
Amphibolites with chert inclusions.
SKETCH PLAN
Amphibolites
lurian
N
Amphibolites
Heathcotian Cherts and Jasperoids
Amphibolites.
Approximate Scale, 40 chains to One inch.

FIG. 40.

On the geological sketch plan I have indicated the main formations near the river, showing approximately the trend of the chert and jasper beds. In these the phosphatic rock, with wavellite veins probably occurs, as at Tatong. The specimens analyzed were probably found between the Howqua River and the heads of the Lick Hole Creek.

The second sketch plan shows the chert and jasper areas near Tatong, Mansfield, and near Mount Buller. The latter beds are very much like those at Tatong.

The chert inclusions in the amphibolites, and the main chert formation are exactly similar in character, and must have had their cherty texture before the intrusion of the amphibolites.

The Silurian beds are only a little altered, and quite distinct from the cherts and jasper beds, which helps to bear out my report on the Tatong cherts and jaspers.

On my trip to the Great Rand Mine, and back to Mansfield, I noted roughly several formations which are not indicated on the Geological Map of Victoria. (See Plate XXXIV.)

1. Outcrops of the Mansfield sandstones and chocolate mudstones (Carboniferous) occur to the south of the Howqua River.
2. Amphibolites occur to the east of the Lick Hole Creek also, and with serpentine at the Great Rand, and around the new chert area.
3. Amphibolites occur all along the track east of Stockyard Creek up to near Mount Warrambat (Timber Top)

[*Report sent in 9.5.05.*]

THE EDI TURQUOISE FIELD, KING RIVER.

By E. J. Dunn, F.G.S., Director, Geological Survey.

All the turquoise-bearing outcrops in the neighbourhood of Edi have been met with in the belt of country lying between the Black Range and Sheepstation Creek. This tract is hilly to mountainous, well watered, and from 1,200 to over 2,000 feet above sea-level.

The whole area consists of sandstones and slates apparently of Ordovician age, but no fossils were detected by which this point could be settled. The beds are highly inclined and evidently folded over axial lines, for on crossing this strike, they are found dipping alternately in opposite directions. The strike of these beds appears to be very regular at about 35 deg. to 37 deg. W. of N. The slates and sandstones in places bear ample testimony to the severe stresses they have been subjected to; the slates are often "creased" in a remarkable manner.

Since my first visit extensive mining operations in search of turquoise have been carried on at several localities. The most southerly locality is marked No. 1 on the accompanying plan. The ground is held by Messrs. Newman, Gascoigne, and others as a Mineral Lease (No. 928). The workings are on the crest of a ridge just within the north-west end of the lease. Elevation above sea-level, 1,800 feet.

For a width of 3 chains the slate belt carries turquoise veins and an open-face cutting has been carried in across nearly this width and to a depth on the working face of from 30 feet to 50 feet. The southern end of these workings is the latter depth from the floor to the surface on top of the ridge. From this floor a shaft has been sunk to a depth of 45 feet.

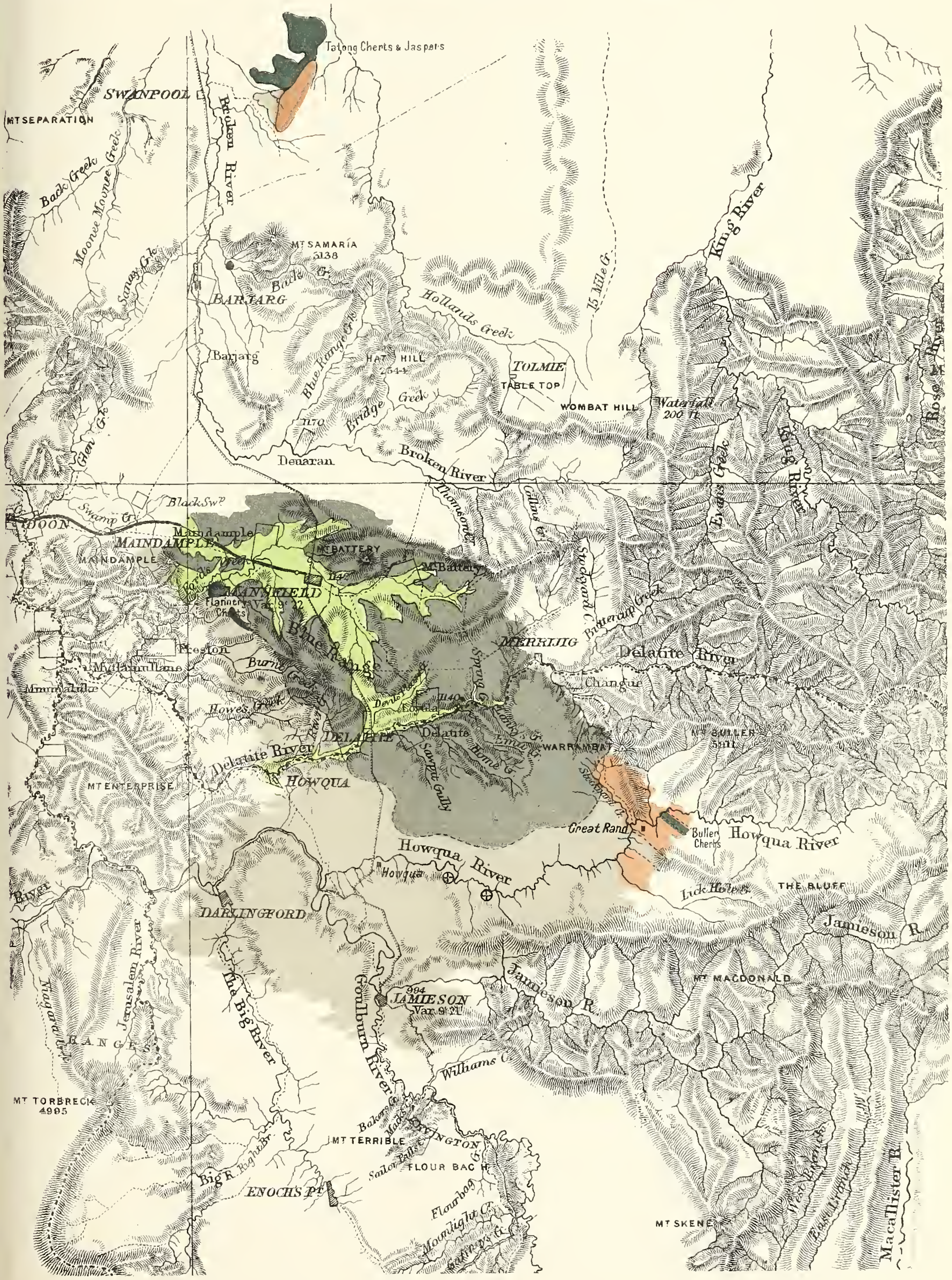
Sketch Plan showing
CHERT AND JASPER ROCK AREAS
NEAR TATONG, MANSFIELD AND BULLER.

Scale, 8 Miles to One Inch

REFERENCE

🟩 Recent ▨ Carboniferous? ☐ Silurian ■ Cambrian? (Cherts, Jaspers etc) 🟧 Porphyry & Amphibolites (Devonian)

⊕ Carboniferous outcrop.



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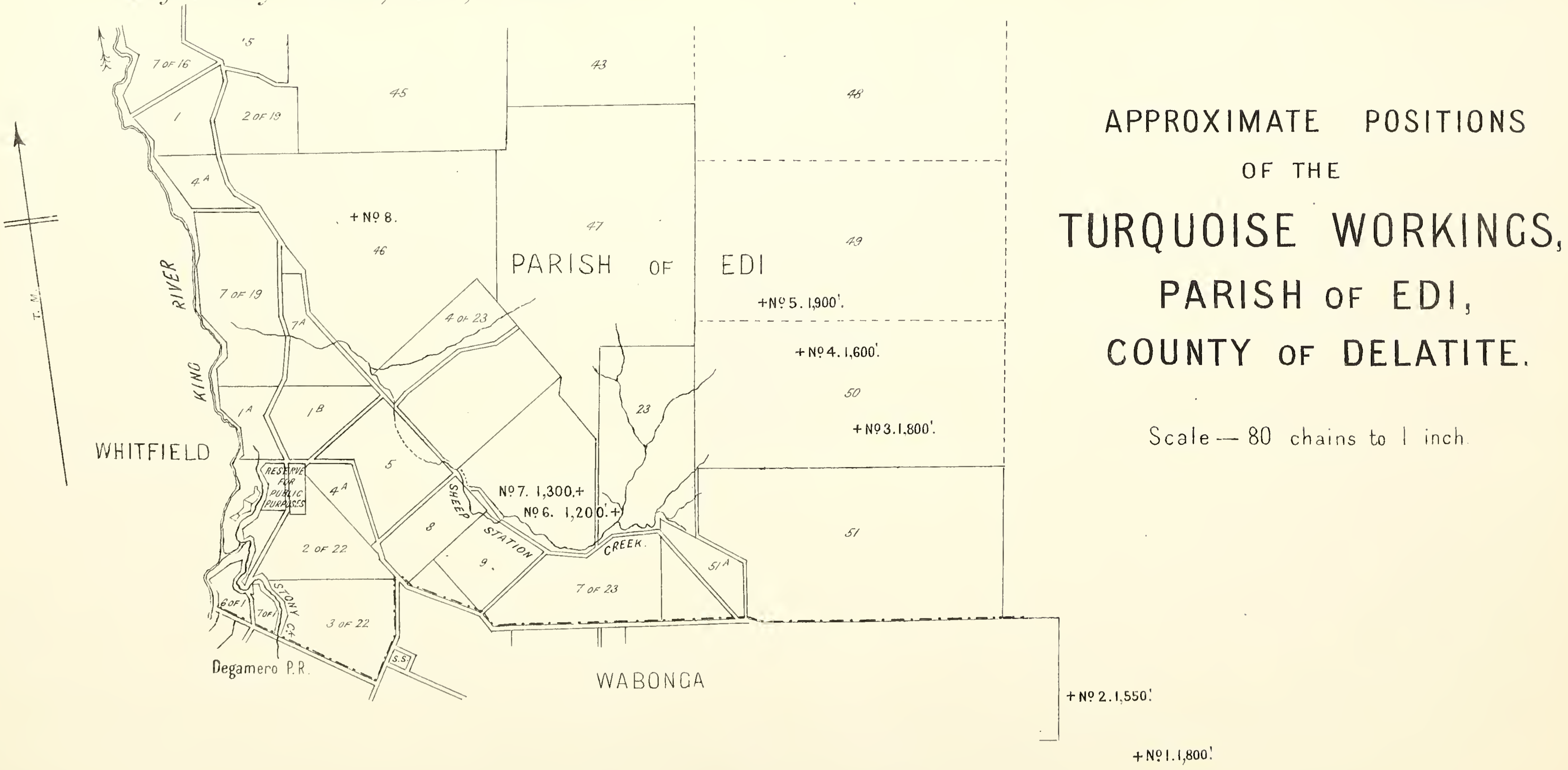
APPROXIMATE POSITIONS
OF THE
TURQUOISE WORKINGS,
PARISH OF EDI,
COUNTY OF DELATITE.

Scale — 80 chains to 1 inch.



Turquoise from thin films up to 1 inch veins has been obtained from the surface downwards in black slate which is weathered grey near the surface. Much of the turquoise is of green colour, and some of it has perished, and is soft and pulverulent. Thin veins of very good colour were obtained, the best at some distance from the surface.

The strike of the black slate with the narrow sandstone bands is N. 35 deg. W., and it dips 85 deg. S.E. The veins of turquoise do not conform to the bedding planes but some of them run irregularly with the strike also diagonally across it. In the lower part of the open workings very little turquoise was observed, and none is said to have been found in sinking the shaft. The slate from the shaft is black and contains iron pyrites, and the rock is in an unaltered condition.

Excellent tip ground exists at this site both on the east and west side of the ridge. So far the workings have been confined to the west side only. What the return has been for the large quantity of rock removed could not be ascertained.

No. 2 locality is on the line of strike in a north-westerly direction, 45 chains from No. 1 locality. It is known as the "New Discovery" (Lease 927), and is the point at which the first workings were opened. It is 1,550 feet above sea-level and on the south side of a small gully. The rock here consists of slate, black where protected from atmospheric influences, and faded to a light grey nearer the surface. The strike is N. 35 deg. W. and the dip 85 deg. N. A cutting has been made along the strike for about 100 feet in length, and to a depth of 35 feet in the deepest part. Near the east end of the opening a shaft has been sunk 30 feet. The best turquoise veins are within a belt of slate about 3 feet wide, and the stone was obtained from the surface downward. In the deepest part of the workings the veins become very scarce; although the best coloured stone is found furthest from the surface, it appears to run out in depth and below the present floor may not continue for more than a few feet. An excellent section can be seen in a deep barrow-road that has been cut across the slates.

In the slates are many small lenticular black bodies which weather to light grey on exposure, and have a texture greatly resembling the turquoise. Where the rocks in the deepest part of the cutting are least altered, iron pyrites occurs in them. As at the previous site the slates have a "creased" and crushed appearance. Mr. P. Gascoigne is working this lease and the débris from the workings forms a large tip, but what the result has been in monetary return is unknown.

No. 3 locality is 2¼ miles on the line of strike from No. 1 locality in the same direction as No. 2. This lease (No. 1,697) is known as the "Mount Avis Extended"; it is 1,800 feet above sea level, and is situate on the northern slope of a spur. The strike of the rocks is N. 35 deg. W. and their dip 5 deg. S.W. Along the strike there is an excavation for 60 feet in length, 20 feet wide, and 35 feet deep at the deepest part. Black slate, weathering grey near the surface, is the rock the turquoise occurs in. On the south-westerly side of the slate band a light-grey sandstone belt occurs. There is much evidence of faulting, crushing, &c., and slickensides are strongly marked. Just below the deepest face a tunnel has been driven in; the rock from this tunnel is black slate with iron pyrites, and no veins of turquoise are observable in it, although they were common nearer the surface. It is reported that no veins were found in the tunnel and none of the tip stuff showed any. In the open workings on the north-east side quartz veins are very common in the slate. They are rarely more than $\frac{1}{2}$-in. wide, and turquoise veins are associated with them, but in every case the turquoise is of newer date. It may intersect the quartz but the reverse never happens.

The sides and roof of the tunnel are encrusted with green and blue coloured sulphates, &c., formed by the decomposition of iron pyrites containing a little copper. These incrustations which have been formed by the weathering of freshly exposed surfaces of country rock where unaltered and impregnated with pyrites, are very significant and probably indicate the manner in which the turquoise has been formed.

Here the work of searching for turquoise has been carried on more extensively than at the other sites, and very good stone has been found according to report, but as no work was proceeding, and none of the good stone was visible, there was no opportunity of verifying the statements.

Surface streaks of turquoise are common in this lease, and there is still unworked abundance of ground showing such indications.

No. 4 locality is in the same direction as the last, but $2\frac{3}{4}$ miles from No. 1, and is 1,600 feet above sea-level. The Lease (No. 1,671) is known as "Mount Avis" Lease. Very little work has been done here beyond breaking off a few feet of the surface rock in which stains of turquoise were common. A tunnel in the lowest portion of the outcropping turquoise bearing slate was commenced. The rock is not much altered at this spot, and no turquoise appears to have been met with at this site, although in the same beds higher up it was plentifully present, but in thin veins and of greenish colour. The strike of the beds is N. 37 deg. W. and the dip vertical. The rock carrying the turquoise veins is a black slate weathering to grey at the surface. The beds are much crushed, creased, and faulted.

No. 5 locality is in the same line of strike from No. 1 workings, and 3 miles distant in a straight line. The country rock is black slate weathering to grey near the surface. Greenish-coloured turquoise cropped out at the surface here and thin seams of it traverse the slate. An excavation 50 ft. x 20 ft. and 10 ft. deep at the deepest part has been made here, and lower down a tunnel has been driven about 60 feet in under where turquoise shows freely in the surface stone. No turquoise veins are showing in the sides of the tunnel. The slate is black and contains pyrites. Sulphates, &c., the result of decomposition of the iron pyrites have formed an incrustation on the sides and roof of the tunnel. This "crust" is stained blue and green.

Nos. 3, 4, and 5 localities have been worked by Mr. C. Meyer, and from the extent of the workings a considerable output of turquoise may be inferred, but with what pecuniary results is unknown.

No. 6 locality is on Mr. J. Graham's farm, near Sheepstation Creek, and at this spot a small creek exposed a vein of blue turquoise in the slate forming its bed. Very little has been done here, although the surface indications are favorable. A trouble that would soon have to be met at this site is water, for the bank of rock is but a few feet above creek level. The height above sea-level is 1,200 feet. The usual greyish slate occurs at the surface, and the unaltered black slate has not been reached.

No. 7 locality is about 15 chains north-westerly from No. 6. At this site, known as the Masson Company's workings, a shaft has been sunk over 20 feet deep, and a deep narrow cutting has been brought in from the hillside. For part of its course it follows the strike of the rocks, and is 25 feet deep at the face. The rock in which the turquoise is found is the usual black slate, which weathers grey near the surface. Turquoise in veins up to $\frac{3}{4}$-in. thick is found here, but most of it is of a pale-green colour, and unmarketable. In a smaller cutting near the shaft, stone of good quality is reported as having been found. A great deal of quartz occurs. The black slate, which shows the effects of strains, &c., from its crushed, creased, and faulted condition, is but little altered in the deepest portion of the workings. The " faces " of the quartz in the veins are commonly covered with thin films of turquoise of greenish colour. The quartz in the veins attains to as much as a foot in thickness.

No. 8 locality was described to me, but was not visited, as only a small opening has been made.

SUMMARY.

First, as to the country rock: It is obvious from the accompanying plan that the sites of Nos. 1 to 6 workings are on the same belt of slate, the strike of which is about N. 37 deg. W. Nos. 6, 7, and 8 are on a parallel belt, and quite possibly the same zone which has been folded up again to the surface along the strike of these latter sites. In searching for turquoise, a knowledge of this fact, and that by following the strikes from a known locality others may be discovered, should be of service. This was pointed out to the first prospectors three years ago, and the workings amply justify the opinion then formed.

Black carbonaceous or graphitic slate is the rock in which the turquoise forms veins at all the sites, and the constituents of the turquoise—phosphorous, alumina, and copper—are doubtless all present in the slate, and have evidently aggregated to form the mineral in the veins at a very recent date. The quartz veins have formed from siliceous solutions, since the rocks were bent and folded over, and the turquoise veins are of still later date, for they cut through the quartz veins where both occur together. In what form the phosphate originally exists in these beds is uncertain. Whether disseminated through the black slate or isolated in the thin lenticular bodies so common in some of the seams, analysis must determine, but the decomposition of iron pyrites appears to be the preliminary step by which the turquoise product is eventually produced.

The freed sulphuric acid appears to react on the phosphatic and aluminous matter present, and the green or blue colour is produced by traces of copper, doubtless furnished by the iron pyrites.

Turquoise of pale-green weathered aspect occurs right at the surface in each locality. Further down, the colour of the stone improves, and the quality is better. This continues down to 30 or 40 feet from the surface, but below this the rock is unaltered, and the pyrites unoxidized, and here the veins of turquoise do not appear to penetrate, for below there is an absence of this mineral. In any case, where deep shafts have been sunk or tunnels much below the surface have been put in, no turquoise has been discovered, although the rock nearer the surface is thickly veined. The only conclusion to be arrived at from the work so far done is that the turquoise is produced in certain bands of slate which contain the requisite elements, by means of the decomposition of iron pyrites, and subsequent reactions induced thereby, and that, as a consequence, the turquoise does not exist much below where atmospheric influences have induced an alteration of the slate and its constituents. Not much below, because some examples show black slate studded with unaltered pyrites and traversed by turquoise veins, but such a case may be the extreme downward extension of a fissure in which the turquoise has formed from solutions filtering through the altering portions of the slate.

The veins appear to have formed in precisely the same way as quartz veins. The fluid found, perhaps, a minute fissure, and deposited a thin film therein; to this film the segregation of other similar matter would follow, and gradually the fissure would widen and extend in all directions, being followed up and wedged open by still further accumulations. The incrustations on the sides of the tunnels plainly indicate that the process may still be in progress, and that turquoise may form even in artificial cavities.

At the several localities, examples occur where the country rock is broken and the spaces are filled in with turquoise, forming a breccia. The veins range from mere films up to more than an inch wide, but the larger pieces are generally coarse, and of poor colour (pale green, &c.). Every stage of the growth of the mineral is to be seen in the various localities. In some cases, narrow joints have their sides thinly coated with mammillated turquoise, in others, the crack is nearly filled, or again, it is occupied by dense beautifully coloured mineral. After it has been formed, exposure to the atmosphere seems to cause it also to decay, for near the surface some very soft pieces and veins are met with.

So far as mining for this gem stone is concerned, it seems, from present experiences, that such operations will be confined to the surface, and to moderate depths—30 to 40 feet—and, therefore, open workings will best answer the purpose.

Some of the seams of turquoise are of a beautiful colour, and specimens kept for three years have not perceptibly faded or changed colour. No data was obtained on which an opinion could be based as to whether the turquoise can be profitably mined. Sufficient work has been done for this purpose, but no particulars as to the quantity and value of the turquoise are ascertainable.

Quite lately, fissures in slate filled with turquoise similar in character to the above-described occurrences have been found a few miles from Benalla.

[*Report sent in 28.12.93.*]

SOME MINES AT CHILTERN.

By W. Baragwanath.

The Golden Bar Mine.

The Golden Bar Company have a main shaft sunk to a depth of 350 feet, with two levels opened out east and west at 235 feet and 342 feet respectively. At the No 1 level the Golden Bar reef was found 26 feet to the east of the shaft. The general dip of the reef is to the east at 73 deg., and the general strike is N. 27 deg. W. The width of the reef varies from a few inches to 3 or 4 feet.

At the plat at this level, nicely laminated quartz veins (droppers or legs) occur in a belt of hard contorted mudstone.

At 16 feet west of the shaft a small vertical laminated quartz lode 6 inches wide was passed through in vertical beds of slate.

At 40 feet west of the shaft there is a large slide dipping 1 in 1 to the west.

At a point 65 feet from the shaft, drives were put in north and south, and stopes carried out on a small lode which is apparently a leg conformable with the bedding planes. Twelve feet west of this drive a small synclinal fold followed by an anticline was passed through, and the cross-cut continued in strata with a westerly dip as far as the face.

There are numerous spurs of quartz and faults throughout the strata.

At the bottom level (342 feet), the cross-cut east intersected the Golden Bar lode at a point 60 feet from the shaft. The reef here was from 6 to 8 feet in width. A rise connects this level with the upper one, and preparations are now being made for stoping large quantities of quartz which has already proved to be payable.

At 105 feet west of the shaft at this level, the No. 1 reef was intersected and driven on north and south. In the stopes this reef appears to be nearly vertical, and the amount of crushing material varies from a couple of feet where the reef is "pinched" to 10 or 12 feet where spurs are met with.

Twenty feet west of the No. 1 reef, another line known as the No. 2 reef was found, and this has been driven on north and south. South of the cross-cut the reef was worked 15 feet in width. It continued as a wide reef for over 40 feet, and then tapered out, the south face at 100 feet showing no stone. Underhand stoping was carried out to a depth of 6 feet below this level on the large body of stone. Northwards the reef was stoped for a length of 100 feet from the cross-cut. At this point, the reef apparently forms a west leg conforming in dip with the strata (westerly at 55 deg. to 60 deg.).

At a point 30 feet west of the shaft there is a small reef which appears to be identical with the one which was cut in the upper level. This reef is 6 inches wide, and prospects about 15 dwts. per ton.

Faults at this level are numerous, but the amount of displacement is not ascertainable.

From old workings to the north of the present shaft, specimens of a decomposed dyke were noticed. This dyke appears to have an easterly and westerly strike, but has not been cut in the present workings. To the south-west of the main shaft there is a cross reef which has been worked to a depth of 200 feet on a vertical make. What appears to be the same reef shows at the No. 1 level, and a drive southerly along this would probably reveal payable stone.

Further cross-cutting, especially in an easterly direction, should be carried out at this mine as all the bodies of quartz yet met with appear to be of an auriferous nature. Shaft sinking and further development of the reef should also be carried out.

A complete crushing and cyanide plant together with a suitable winding plant are at present on the mine, which apparently possesses more than ordinary possibilities.

GOLDEN BAR NO. 1 COMPANY.

The shaft at this mine has been sunk to a depth of 200 feet, and there is an east and west cross-cut at 180 feet from surface. The strata passed through dip to the west at angles varying from 30 deg. to 85 deg. Easterly, at a point 94 feet from the shaft, a lode track carrying numerous spurs is at present being driven on. Auriferous quartz is at times met with, but very little has yet been proved.

ROBBIE BURNS COMPANY.

The only level surveyed in this mine was 333 feet from the surface. A northern drive, 240 feet in length, follows along a well-defined lode channel carrying a solid body of quartz, which varies in width from a thread up to 18 inches. This reef underlies to the east, while the country rock dips to the west. For about 20 feet on either side of the shaft, stopes have been carried overhead. The lode channel continued south from shaft, but was not payable until a shoot of gold was found south of the cross-cut. This shoot of payable quartz was stoped above and below the level. It appears to have been at the intersection of a narrow but rich west leg and the main reef.

A cross-cut to the west, at a point 105 feet south of the shaft, passed through a bar of sandstone, which is over 100 feet in width and dips to the west at 43 degrees.

Two hundred and forty feet south of the shaft, a cross-cut to the west from the drive on the west leg cut the main reef at 12 ft. 6 in. It is here 4 feet wide, and a rise is at present being put up.

JUBILEE COMPANY.

The shaft of this company is at present being sunk to work at greater depths the Jubilee line of reef, which was worked with reputed profitable results from the surface to the water-level. As the stopes of the former workings were accessible, an inspection was made. A length of 60 feet has been stoped at 40 feet from the surface, and the reef is vertical, and about 2 feet in width. At about 100 feet from the surface a fault threw the reef about 5 feet to the east, but a few feet lower down the reef was found again on its original course. At a depth of 160 feet, the reef widened out, and the stopes are here over 5 feet in width and about 200 feet in length.

At the southern end of these workings, another formation, consisting of numerous spurs between well-defined walls, and called Callougher's Reef, was worked to a depth of 200 feet. It varied from 3 to 5 feet in width, with a strike of N. 12 deg. W., and a slight dip to the west.

At the top level in the main shaft, the shoot of stone could be seen pitching northwards, and a winze connecting with the lower level followed down on a well-defined wall with but little ore.

At the lower level, there is a body of quartz 2 ft. 6 in. wide, and of nicely laminated appearance. As this is below water level, a sample was obtained for assay. The result was—gold, 10 grs.; silver, 10 grs. per ton. The northern end of this reef was displaced by a fault.

[*Report sent in 16.11.05.*]

CLARKE'S NEW FIND, FULTON'S CREEK.

By W. Baragwanath.

Clarke's New Find is situated on the southern side of Fulton's Creek, about half-a-mile east of its junction with the Aberfeldy River, and about 500 yards north-east of the Bindon Reef. The reef was discovered by a prospector named Clarke, who loamed up the spur and traced the source of the gold to the lode outcrop.

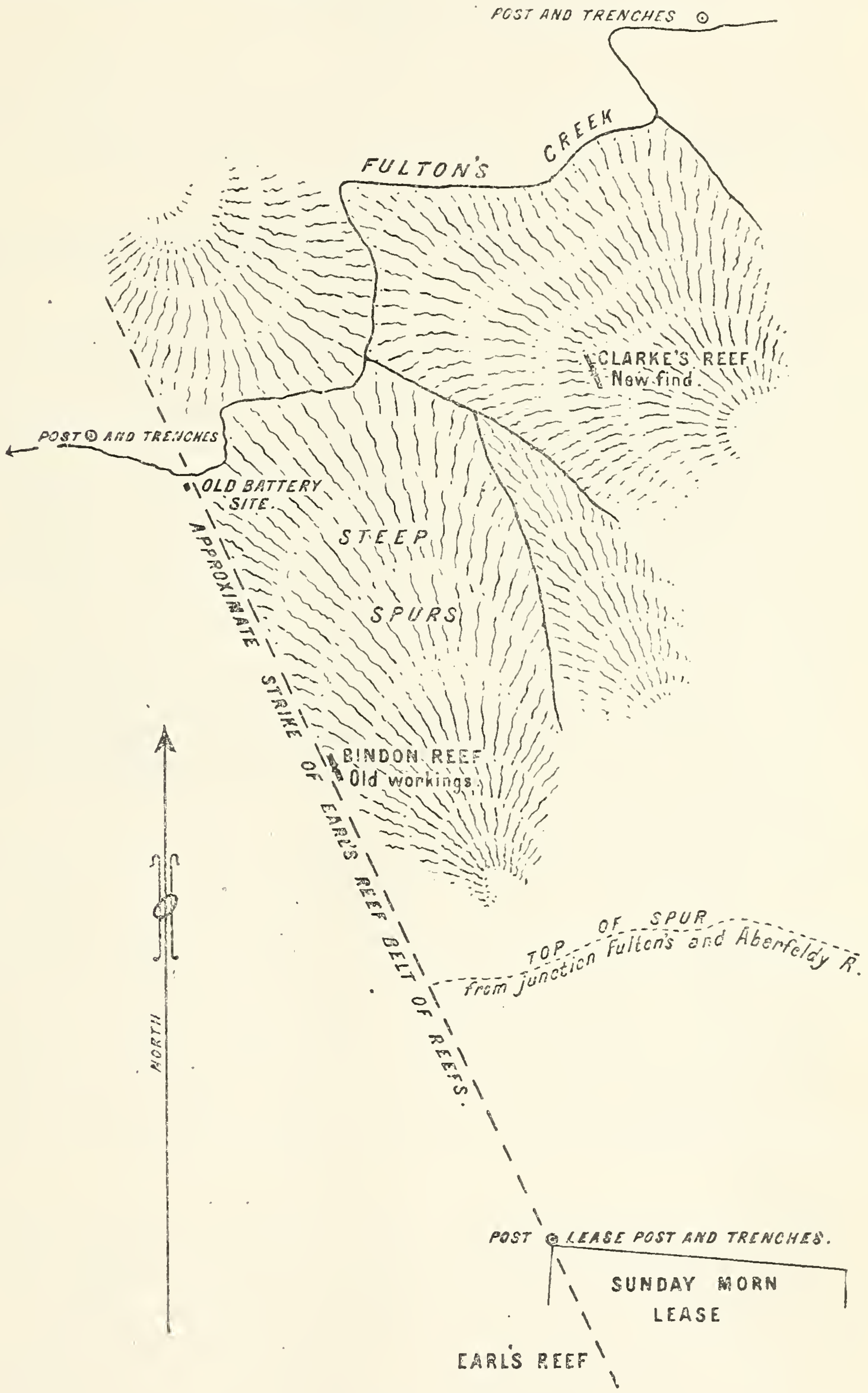


FIG. 41.
Plan : Scale 12 chains to 1 inch.

At the date of visit the workings were partly filled in owing to the owner of an adjoining mine taking legal action for trespass on a prospecting area held by his company.

From what could be seen of the workings, the formation appeared to be about two feet in width, with fair prospect of gold on both walls and throughout the central portion of the formation. The reef dips east at an angle of 45 degrees, and its general strike is N. 18 deg. W.

As large areas adjoining are held under prospecting claims, it is not advisable for prospectors to visit the locality at present, but the field is one on which numerous other outcrops most likely occur, and the rich patches of gold found in Fulton's Creek strongly support this view.

[*Report sent in 8.2.06.*]

THE CRINOLINE EXTENDED MINE, DONNELLY'S CREEK.

By W. Baragwanath.

The Crinoline mine is situated on the eastern side of the Morning Star Creek (one of the main heads of Donnelly's Creek), near its junction with Growler's Gully.

The lode was discovered by surface loaming at a point about 150 feet above the level of the junction of Growler's and Morning Star Creeks. The lode consists of crushed and broken strata, through which veins and strings of auriferous quartz occur in places. There is one well-defined wall, and the lode varies in width. Slabs of quartz occur along the wall, which has an average dip of 60 deg. to the east. Trial crushings from the surface outcrop proving highly payable, a shaft was sunk to a depth of 55 feet, and from the bottom a stope was taken out to the south for a distance of 25 feet on a body of quartz up to 3 feet in width, and continuing under foot.

About 80 feet to the south-east of the main shaft, auriferous quartz was proved on the surface. Further south than this the whole of the strata on the hill-side has been disturbed by a terminal thrust. What appears to be the continuation of the reef can be seen in this faulted strata, but here it is almost horizontal.

In order to test the reef at a depth, an adit was driven from a point about 10 feet above the level of Morning Star Creek. This adit has a bearing of N. 25 deg. E., and it cut the line of reef at a point 236 feet from the entrance. The reef, where cut, carried a make of quartz about 8 inches wide, with 3 feet of crushed country rock, and veins of quartz on the western side. Drives have been put in 79 feet north and 30 feet south. North of the crosscut two rises were put up. The first at 15 feet north was up 41 feet at the time of this survey. This rise exposed a good hanging wall, dipping to the east at 60 deg., with a body of crushed strata and spurs 2 feet in width, and occasional splices of more highly inclined quartz.

The line of lode occurs along a fault (which is one of many in the neighbourhood) near the contact of a wide belt of hard coarse sandstones, through which numerous segregated veins of quartz occur, and a still wider belt of phyllites and slates. Although no direct evidence as to the age of the beds has yet been obtained, it appears highly probable that they are Ordovician. The same belt of auriferous country extends from Edwards Hill, about 1½ miles to the south, past the White Star and Blackwall mines, and has been proved auriferous at numerous places along its course. Two series of faults occur in the mines to the south, one series having an easterly and the other a westerly hade. Very rich yields have been reported from the reefs associated with these faults, along some of which adits have been driven for over a thousand feet.

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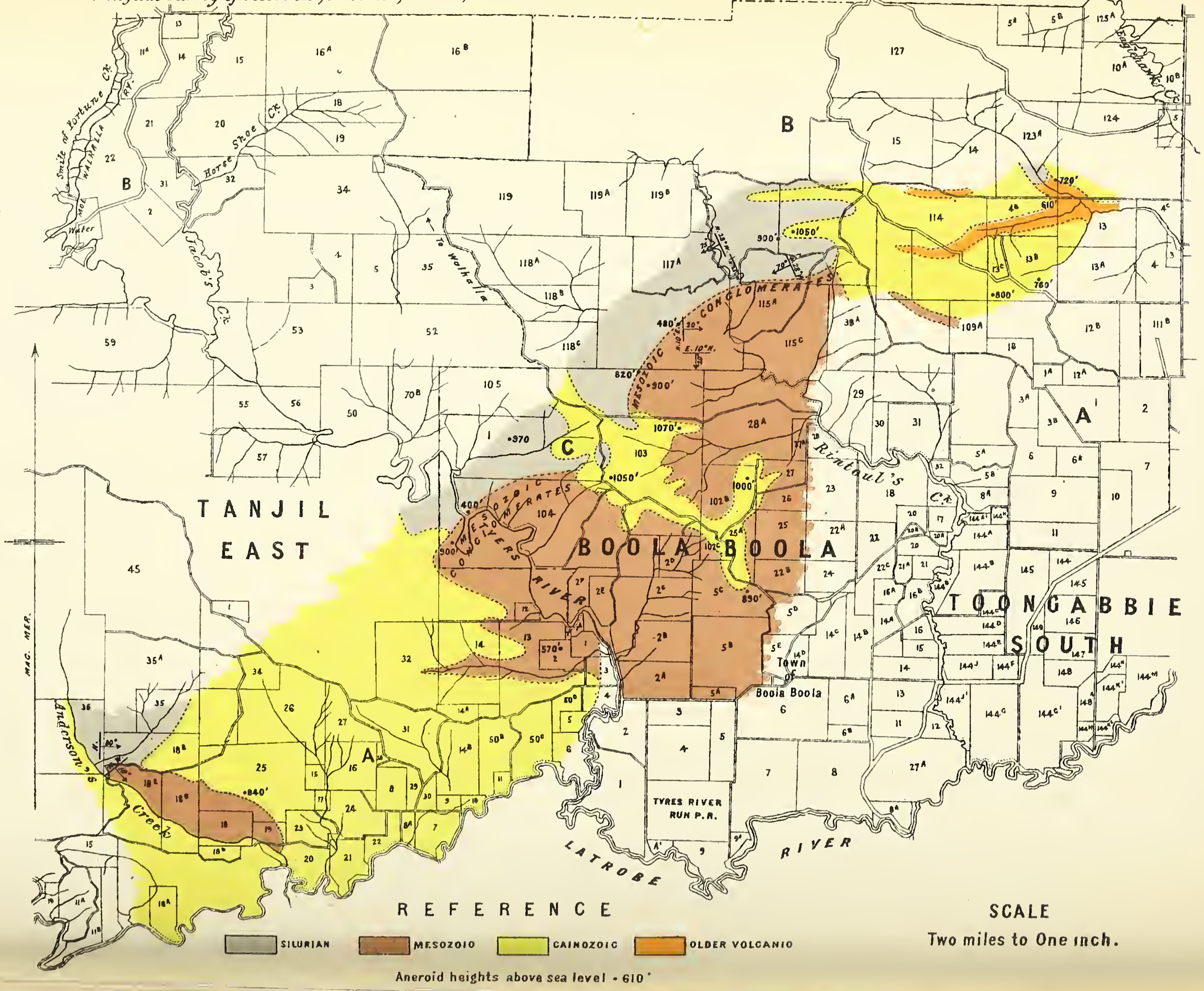
NATURAL HISTORY

Geological Survey of Victoria, Record, Vol. 2, Part 4.

PLATE 26



REFERENCE

▨ SILURIAN
▨ MESOZOIC
▨ CAINOZOIC
▨ OLDER VOLCANIC

Aneroid heights above sea level • 610'

SCALE
Two miles to One inch.

Prospecting along the line of reef by continuing the adit level will either reveal the downward continuation of the shoots of stone proved on the surface, or prove them only small areas in which the auriferous contents has been concentrated by surface enrichment.

About a quarter of a mile to the east of this mine the old workings of the Independent Company are to be seen. These workings appear to have been on a similar class of formation. No yields from this abandoned claim are available.

A dray track has been constructed to the Morning Star battery, where the trial crushings were put through, and an abundant supply of water for crushing and motive purposes flows within a stone's throw of the mine, while all requisite timber is readily obtainable.

[*Report sent in 10.12.05.*]

GEOLOGICAL BOUNDARIES IN THE TYERS RIVER DISTRICT.

By J. Easton.

The attached plan (Plate 26) shows the northern boundary of the Mesozoic rocks in the locality of the Tyers River.

The Mesozoics along this boundary consist of a series of basal conglomerates and grits composed of the worn-down fragments of the underlying Silurian strata. The conglomerates consist of sandstone, quartz, and quartzite shingle ranging up to a foot in length, and are to be seen in thick beds and detached boulders in the valley of Rintoul's Creek, and at the falls of the Tyers River.

On Rintoul's Creek, near the contact, the conglomerate beds dip away to the southward at a slight angle, and about half-a-mile lower down the creek, where a conglomerate bed overlies a finer grit and carbonaceous shale, the dip is about S. 10 deg. W. at 20 deg.

The Silurian strata near this contact, and at some distance from it, appear to have a uniform strike of about N. 25 deg. W., and a westerly dip of from 70 deg. to 80 deg.

On the Tyers River I was unable to obtain any reliable information as to the strike or dip of the Silurians, as at this point there is an extensive belt of rubbly shale through which the river runs for some distance above the contact. The Mesozoic conglomerates on the west side of the Tyers appeared to be dipping a little to the west of south, at an angle of about 20 deg.

In Anderson's Creek the Silurian strata have a north and south strike, and dip to the east at 80 deg., while the Mesozoics near by dip to the S.E. at a very low angle.

The Silurian and Mesozoic formations intervening between these main creeks are covered by a capping of Tertiary rocks, which also overlie some old volcanic flows, as shown on the accompanying tracing.

I did not obtain any evidence tending to show the existence of a fault line, and therefore consider that the conglomerates of this contact are littoral deposits of Mesozoic age resting on the Silurian.

[*Report sent in 3.8.03.*]

NOTES ON THE FOSTER GOLD-FIELD.

By W. H. Ferguson.

The township of Foster is situated on the banks of Stockyard Creek, on the site of the old Stockyard Creek diggings. It is on the South-Eastern Railway, 107 miles from Melbourne. The railway station is 76 feet above the sea-level, and the altitude of the township, which is three-quarters of a mile away, is about 100 feet. All gold mining operations are in the immediate vicinity of the town. The bed-rock is Silurian, masked by surface deposits.

At first all mining was alluvial. At present only a few alluvial mines are at work, but the Victory quartz mine has been worked for a number of years, and is still working. At this mine a large dyke has been intruded into the Silurian slates, sandstones, and schists. At one place on the surface the dyke looks like a porphyry, while in the mine it resembles a granite. Mr. Jas. Stirling considers that the dyke continues southwards, and is connected with the granitic Doughboy Island, which is doubtless an outlier of the Wilson's Promontory granite. It varies from a few feet to 200 feet in thickness. Its strike is S. 5 deg. E., and it is much faulted. In the dyke there are horizontal or slightly inclined veins of quartz, which extend for considerable distances into the surrounding Silurian rocks. The veins range up to 18 inches in thickness, and yield up to 5 ozs. of gold per ton, and occasionally very rich patches of quartz are found. Two kinds of "indicators" occur. The mine has been developed to a depth of about 500 feet.

It would be a legitimate prospecting venture to try to locate the southward continuation of this dyke. A shaft might be sunk to the west of the Church of England. The bed-rock would most likely be met with at less than 50 feet. A cross-cut of 100 feet could be driven at a small cost. Rich alluvial might be found above the dyke. The dyke might also be located by means of a light portable boring plant.

In 1875, Mr. R. A. F. Murray suggested that the gold in the alluvial deposits capping New Zealand and Cement Hills had been derived from a line of quartz reefs traversing these hills. This seems very probable, and a downward search might well be made for quartz reefs and other dykes.

There are two series of younger deposits. The more recent is the alluvium, which has been worked for gold along the creek. The other consists of gravels, loose or cemented, which cap Dalton's Hill and New Zealand Hill, and occur in places on Kaffir Hill, on the flanks of which the Victory mine is situated. These gravels have been extensively worked for gold, especially on New Zealand Hill, but the richest yields appear to have been obtained on Kaffir Hill, close to the Victory mine. Here, in deep alluvial, stretching from the mine to the creek, auriferous quartz boulders were found, some of which contained as much as 20 ozs. of gold. Almost all the gold had quartz attached to it. The prospectors' claim is said to have yielded gold to the value of £60,000. The gold at Kaffir Hill was evidently derived from the Victory dyke formation, but it is very unlikely that the gold at New Zealand Hill came from the same source.

The following publications of the Mines Department deal with this locality :—

1. Turner, E. W.—Report on the Stockyard Creek Diggings. Quart. Rept. Dept. Mines, Vict., 30th June, 1871.

Sketch Plan

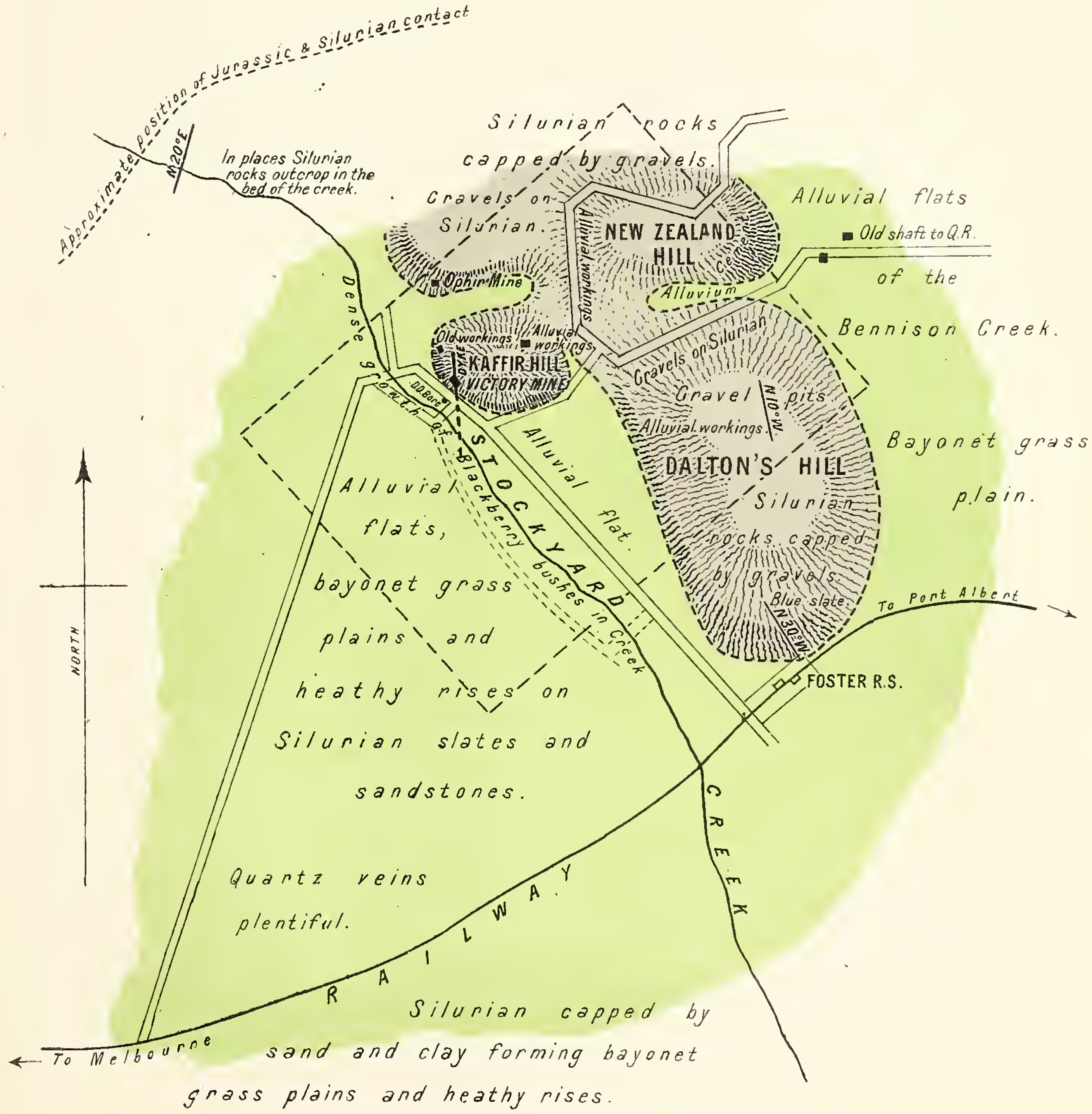
VICTORY MINE

TOWNSHIP OF FOSTER

Scale, 40 chains to One inch.

REFERENCE.

🟩 Recent ⬜ Silurian


Approximate position of Jurassic & Silurian contact
N. 20° E.
In places Silurian rocks outcrop in the bed of the creek.
Silurian rocks capped by gravels.
Gravels on Silurian.
NEW ZEALAND HILL
Cemetery
Alluvial workings
Alluvium
Ophir Mine
Old workings
Alluvial workings
DYKE
KAFFIR HILL
VICTORY MINE
D.D. Bore
Alluvial flats of the Bennison Creek.
Old shaft to Q.R.
Gravels on Silurian
Gravel pits
N. 10° W.
Alluvial workings.
DALTON'S HILL
Silurian rocks capped by gravels.
Blue slate.
N. 30° W.
Bayonet grass plain.
Dense growth of blackberry bushes in creek
STOCKYARD
CREEK
Alluvial flat.
Alluvial flats, bayonet grass plains and heathy rises on Silurian slates and sandstones.
Quartz veins plentiful.
RAILWAY
To Port Albert
FOSTER R.S.
NORTH
To Melbourne
Silurian capped by sand and clay forming bayonet grass plains and heathy rises.

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NATURAL HISTORY

2. Murray, R. A. F.—Report on the Geology and Mineral Resources of South-western Gippsland. Geol. Surv. Vict., Prog. Rept. No. III.
3. Scanlon, E.—History of the Foster Gold-field. Quart. Rept., Dept. Mines, Vict., 30th June, 1891.
4. Stirling, J.—Notes on the Foster Gold-field and District. Geol. Surv., Vict., Prog. Rept. No. VIII.

[*Report sent in 28.8.05.*]

PIONEER MINE, BRIGHT.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This mine is situate about half-a-mile eastward from Bright. It was the first one opened up in this district. The country rock consists of coarse and fine sandstone and slaty beds, very much crushed and faulted. The principal line of fault is known as the E. wall, and from this wall westerly several faults extend into the country at varying angles. The rocks are of grey, pink, and yellow colour, and the soil from them ranges from yellow to red. Extensive bodies of auriferous spurs occur on the E. wall, and on those that branch from it. These bodies have been worked at the surface up the slope of the hill for 200 feet above the level of the lowest tunnel. The width of the spurry country worked was in some cases over 40 feet, so that a considerable bulk of crushing material has been removed from the mine.

The lowest or main tunnel has been driven at a bearing of S. 15 deg. W. for 15,000 feet into the hill, along the course of the E. wall. At the extreme S. end of the tunnel an inclined shaft has been sunk 98 feet at an angle of 32 degrees to the horizon, which is about the pitch southward of the shoots of auriferous quartz. The bottom of this inclined shaft is the deepest point reached in the mine, so that practically all below the main tunnel remains to be explored and worked. From the bottom of the shaft, the Manager informs me a trial crushing of 1,000 tons of quartz was taken, and the return was 7 dwts. of gold per ton. The width of the face from which the quartz was broken out at the bottom of the shaft is stated to be 24 feet.

The main wall is strongly marked at the bottom of the shaft.

At the top of the inclined shaft, and to the S.W. of it, a great deal of quartz has been stoped. The faults from the E. wall intersect one another in a most irregular manner, and at such places auriferous spurs appear to have formed. A great deal of prospecting is required to discover the position of such ore bodies.

The spurs on the E. wall appear to occur in a more regular fashion, and by driving along this wall the spurry country can scarcely be missed. So far as the work has proceeded, the auriferous shoots show a southerly pitch at an angle of about 32 deg., and this is about the pitch of the country rock.

Judging from the quantity of crushing material taken out of the mine, along the main tunnel, there should be a considerable quantity available below that level, and the best way to test this would be by continuing the present inclined tunnel, at any rate for 100 feet or so below the present bottom workings. After that the advisability of a vertical shaft would have to be considered.

The crushing plant is but a few hundred feet from the mouth of the tunnel: it is driven by water power, and the cost of crushing is very low. There is abundance of water available throughout the year. Electric light is installed throughout the mine, and electric haulage and pumping can be installed at a moderate outlay. The conditions are favorable for making a low-grade ore pay. At present a syndicate is engaged in further opening up the mine. Mr. Kenny has made a survey, and plans of the mine will be published.

[*Report sent in 18.10.06.*]

THE TRIDENT MINE, STACKEY GULLY, BRIGHT.

By J. P. L. Kenny.

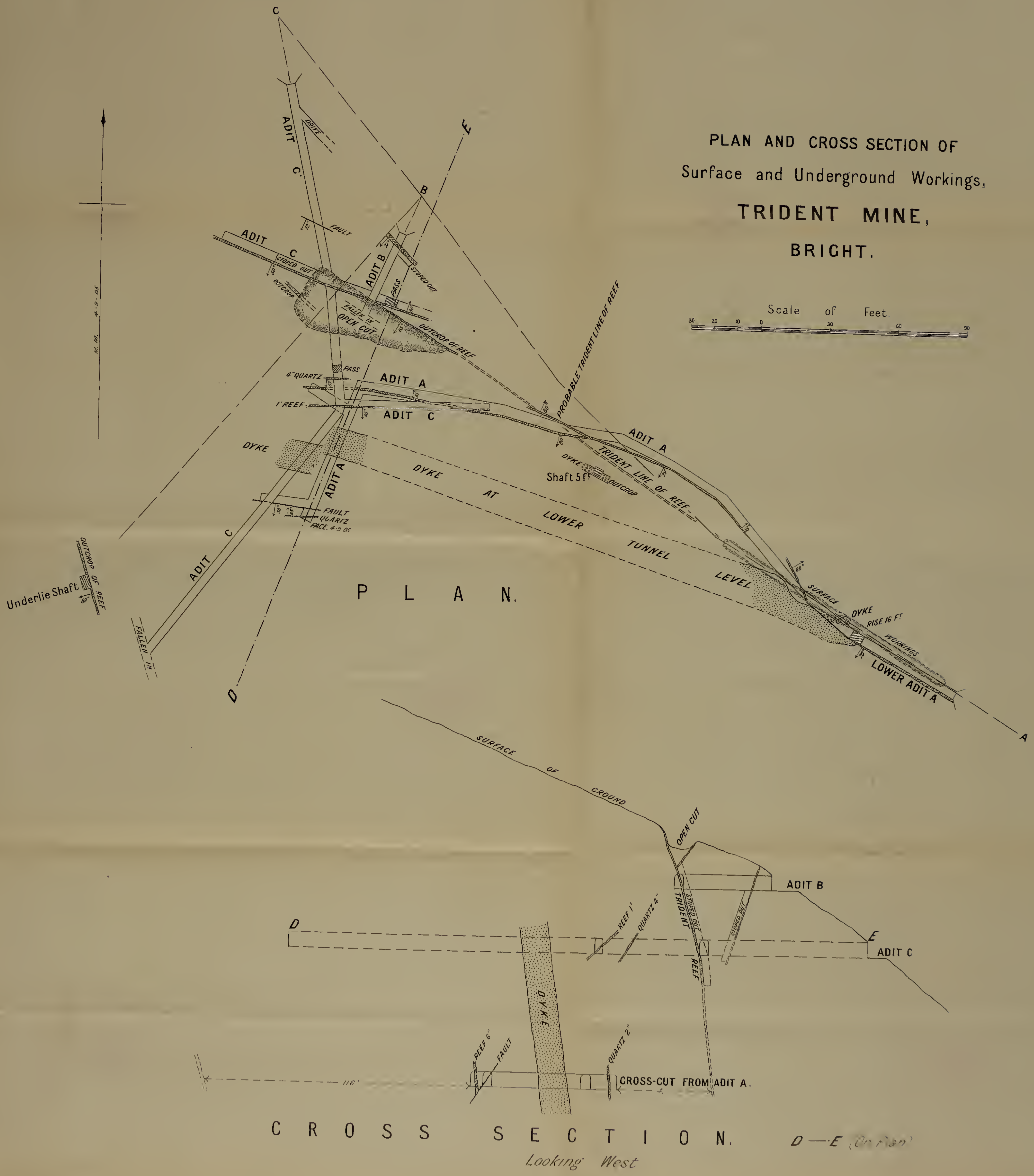
The Trident mine is situated near the head of Stackey Gully, about three miles N.W. of the town of Bright, at an elevation of 1,980 feet above sea-level. The workings are on a main line of reef, which has been worked to shallow depths at various points along the line. The reef strikes W. 33 deg. N., and has an eastward dip of about 80 degrees.

At the Trident workings an open cut extends for 65 feet. The main Trident line dips to the east. On the eastern side of the open cut another line, with a western dip of 55 deg., can be seen. This line would join the Trident line at a depth of 15 feet. Both lines appear to have carried payable stone at the surface.

At a vertical depth of 25 feet below the outcrop, an adit (B on plan) has been put in for a distance of 38 feet to the Trident line. The reef has been stoped out on each side of the tunnel. At a distance of 5 feet from the mouth of this tunnel a reef striking W. 44 deg. N., and dipping S.W. at 71 deg., has been cut. A shoot of gold about 10 feet long, and pitching southward at 65 deg. has been worked down below the adit level. The country rock here strikes W. 10 deg. N., with a dip of 65 deg. to the south. At a level of 53 feet below the outcrop, a second adit (C on plan) has been put in. This adit cut the reef worked near the mouth of the upper adit (B) at a distance of 60 feet. The line here carries no quartz, and has not been driven on. The Trident line is intersected at a distance of 88 feet, and drives north and south have been put in on the line. To the north of the adit the reef dips westerly at 50 deg., while to the south the dip is east at 80 deg., the change in underlie occurring just where the tunnel intersects the line. About 5 feet north of the adit a shoot 20 feet long, and pitching south at 55 deg., has been worked down below the adit level, and another shoot has been worked to the south. At 140 feet from the mouth of the adit a reef 1 foot wide, dipping south at 45 deg., was intersected. A drive east for about 60 feet has been put in on this line, but no payable stone has been met. About 20 feet west of this, a dyke 14 feet wide shows in the adit. The dyke is decomposed to a reddish brown, earthy rock containing very hard undecomposed nodules, which are dark blue in colour. The adit is continued for a distance of 98 feet past the dyke, and cuts another line to the west, which has been worked on the surface. The shoot appears to have been worked down to this level, but the drive is inaccessible.

The adit now being driven (A on plan) is 59 feet below the level of adit C. It has been driven west on the line of reef from a gully to the east. The reef has been worked on the surface for a distance of 115 feet west from the adit mouth, but no payable stone has been obtained

PLAN AND CROSS SECTION OF
Surface and Underground Workings,
TRIDENT MINE,
BRIGHT.



PLAN.

CROSS SECTION. D—E (On Plan)

Looking West

BRITISH MUSEUM

at the adit level. The reef here has a bumpy wall nearly vertical, and dips sometimes to the east, and sometimes to the west. The line carries a little quartz up to 6 inches thick in places. At a distance of 48 feet from the mouth, a dyke shows on the western side of the reef for a length of 47 feet; the dyke then bears more to the west than the reef, being intersected again in a cross-cut west, at the end of the drive.

The dyke is about 12 feet wide, and does not show on the eastern side of the Trident wall. The lower adit has been driven on the Trident line for a distance of 196 feet. At this point a line was cut striking more to the west. The drive has been continued on this western line. The eastern line is here the probable Trident wall, and carries a little gold. The line strikes W. 30 deg. N., and dips easterly at 80 deg. It carries 1 foot of quartz at the junction. A drive on this line for 40 feet should cut the shoot worked above. The drive on the western line has been continued another 100 feet. Very little quartz having been found, a southerly cross-cut has been put in at the end of the drive with the object of cutting the western reef. This cross-cut is now in 60 feet, and, with its present bearing, would have to be driven 116 feet further to cut the western reef. By continuing the cross-cut with a bearing 50 deg. nearer west than it has at present, the reef would be cut in about 70 feet.

The dyke passed through in the upper adit shows 12 feet wide in this cross-cut. The country rock is much distrubed in its vicinity, and the dyke appears to occupy the centre of an anticlinal fold.

[*Report sent in 14.9.05.*]

THE REFORM REEF, MYRTLEFORD.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This reef adjoins the town on the north side. The strike of the north end of the reef is N. 20 deg. W.; dip 60 deg. W.; strike of country rock N. 30 deg. W. The strike of the country rock where the steam winch stands at the mouth of underlay shaft and where the principal work has been done, is N.W.; dip W. 70 deg. The reef dips about 60 deg. W. at this site, and it cuts through the beds both in strike and dip. Pitch of footwall northward. Pitch of shoots of gold south about 45 deg. The pitch of the hanging wall was not clear.

The country rock consists of yellow, grey and pink slate, and brown and grey sandstones. Some of the hard unaltered bluish-grey sandstones from a depth are interlaced with quartz spurs.

A main tunnel (cross-cut) has been driven in from the main street of the town to the reef, and levels were then driven north and south. Near the end of this tunnel, in the level, an inclined shaft followed the shoot of gold down in a southerly direction at an angle of about 45 deg. Another inclined shaft was sunk from the outcrop where the steam winch stands, and this followed the shoot of auriferous stone down for about 500 feet below the tunnel. The outcrop of reef has been worked at several places along its strike and within a distance of about half-a-mile. The continuation of the lode in a northerly direction does not appear to have been searched for very thoroughly. In this direction it passes under the alluvial ground of Myrtle Creek; in a southerly direction it would pass below the alluvial of the Ovens River.

Like many of the lodes of this district there is a lode channel with auriferous shoots of quartz at intervals. Between these shoots there is either a blank with no quartz or else the quartz is not payably auriferous.

This reef was found in very early times (in the fifties) and was discovered soon after the Blue Bell Reef, Palmerston. Extremely rich crushings were obtained and the reef was worked through a long series of years with great profit. There is no reason to believe that its gold-producing capabilities have become exhausted. The earlier workers have, however, removed every bit of quartz they could reach and make pay, and any further prospecting to be effective will involve the sinking of a shaft to the south and west of the shoots so far as they have been worked. Surfacing has been worked down the hill slope from the principal workings but the gullies appear not to have been worked for alluvial gold. The late Mr. Biddington made an effort to reach payable stone through the old workings, and a crushing of 50 tons is reported to have yielded a few dwts. of gold per ton. Taking into account the splendid record made by the Reform Reef there appears to be good grounds for expecting gold at lower levels than have yet been reached on this line of reef. Hitherto no fossils from these beds have been found by means of which their true horizon could be determined. Mr. Easton, however, who is engaged in preparing a geological plan of this district has been fortunate enough to discover some graptolites which are in Mr. T. S. Hall's hands for determination and which will probably afford a clue.[1]

[Report sent in 25.10.06.]

THE LORD OF THE HILLS REEF, GROWLER'S CREEK, WANDILIGONG.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This reef is at the head of Lord of the Hills Gully which runs into Growler's Creek, and is about a mile from Wandiligong and due east.

The country rock consists of yellow and pink sandstones and slate. The soil is red. The strike of the reef is a little west of north, and it is nearly vertical in dip. The workings extend for several hundred feet along the surface; auriferous shoots are worked at intervals with barren portions between. The pitch of the country is southward, and the pitch of the auriferous shoots is also southerly.

Carlyle's line branches from the west side of the above reef and it widens out from the reef in a northerly direction. The Warwick line also branches off from the east side of the reef and recedes from it in a southerly direction. The pitch of the country rock is to the south. The shoots of gold also pitch in the same direction. Tunnels have been driven in to work the reef at a moderate depth, but no work has been done below 100 feet from the surface. It is probable that at lower levels the shoots worked at the surface or similar shoots of payable stone, with barren spaces between, would be found. The quartz ranged from a few inches to 3 or 4 feet in width where worked, but it seldom exceeded 2 feet in thickness. Details of the yields could not be obtained. A party of three men are at present working on this line of reefs.

[Report sent in 18.10.06].

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(1) Mr. Hall found that the graptolites were too fragmentary to be specifically determined, but says that they show the rocks to be Lower Ordovician.—D.J.M.

THE ORIENTAL REEF, WANDILIGONG.

By E. J. Dunn, F.G.S., Director, Geological Survey.

This reef is about 1 mile distant from Wandiligong in a north-easterly direction. Strike of reef N. 20 deg. W.; dip slightly to the west but nearly vertical. At the west end of the outcrop the country rock dips E. 55 deg., so that the reef cuts right across the beds. The strike of the country rock was not clear.

The outcrop was on the slope of the range and was of unusual thickness and length, in fact this was the most considerable as regards the bulk of quartz, and was one of the richest in gold in the district. In some parts the reef was from 40 to 50 feet wide, and it has been worked at the surface for a length of 2,000 feet. Landslips have occurred for hundreds of feet up the hillside above the workings. For years it was the mainstay of the gold-fields.

Yellow, red, and grey sandstone and slate form the country rock which has more resemblance to Silurian than to Ordovician strata. The rocks are very much crushed. In depth the reef splits up, and at 400 feet from the surface, there are four reefs. At the north end also the reef splits up. The principal stoping was done from the surface to a depth of 250 feet. At the lower levels tunnels are driven in, but although there are quartz reefs of fair thickness, the gold content is not payable, and so far the efforts made to discover richer quartz in the lower levels have not been successful.

At the south end of the reef a large dioritic dyke occurs that Mr. Kenny pointed out to me. It is on the west side of the reef; whether this has had any influence on the occurrence of gold in this reef could scarcely be determined now unless the old workings show its relation to the reef at different points.

From this reef an enormous quantity of quartz was crushed and a great deal of gold won, and for many years it afforded employment for a considerable number of miners and others, and when the yields fell off a local syndicate was formed to test the country at a much lower depth. The syndicate was called the Bright District Prospecting and Gold Mining Co., and for about 20 years this syndicate has been engaged in driving a tunnel which would cut the continuation of the reef at about 1,200 feet below the outcrop. The tunnel has been driven 3,850 feet and has reached the spot where the southern extension of the reef should be cut, but so far no reef of value has been disclosed.

Unfortunately the cross-cut, driven for such a great length, has been through a barren zone of country, and therefore it has been of no value for prospecting purposes along its course. The area that should now be prospected by means of the tunnel lies below the old working, but this is held by another company. Such long tunnels under circumstances of this kind are not the best or most economical means of testing reefs in depth and they are seldom of any value for prospecting purposes.

Mr. Kenny will furnish plan and report on this reef.

[*Report sent in* 20.10.06].

THE ORIENTAL MINE, WANDILIGONG.

By J. P. L. Kenny.

The Oriental Reef is situated about a mile to the east of the township of Wandiligong, near the top of the spur between the Ovens River and Morse's Creek. The reef has been worked continuously on the surface for a length of 1,300 feet. The surface stone was very rich, large parcels averaging 3 to 4 oz. per ton. The shoots have been worked to a depth of about 300 feet. From 250 feet to 300 feet in depth the reef was poor, large crushings giving an average of 2 to 3 dwt. The recorded yields from this mine give 46,503 oz. of gold from 109,258 tons of ore, but the total yield is considerably in excess of this, the records for the early years being very incomplete. The Australasia adit (the lowest of the old workings), cut the reef at a depth of 300 feet below the outcrop. A winze has been sunk to a depth of 40 feet, but no stone has been stoped out below the level.

On the surface the quartz occurred in well-defined reefs up to 50 feet wide, closely associated with a dyke. The reefs are found on both sides of the dyke and in the dyke itself.

The dyke is from 15 to 30 feet wide on the surface, but does not show at the Australasia adit level. The dyke can be traced on the surface to the Oriental Gully; to the south of the gully, no dyke or reef can be found on the continuation of the line of strike. At the head of this gully, and 900 feet south-east of the Oriental reef, another line of reef, the Scandinavian, has been worked for a distance of 1,600 feet to the south. This reef is associated with a dyke similar in character to the Oriental dyke.

At the Australasia adit level on the Oriental line, there are three well-defined reefs, known as the "Front" line, the "Tributors" line, and the "Oriental" line. The Tributors' line and the Front line lie to the west of the Oriental line and both dip west. The Oriental line dips 10 feet to the west in the first 300 feet of depth, and below the Australasia adit appears to be vertical.

In 1887, the Bright District Prospecting and Gold Mining Company started an adit to cut these lines at a depth of 890 feet below the Australasia adit. The company has been at work extending this adit since that time, the present length of the adit being 3,832 feet. This adit is 480 feet (measured in a direction at right angles to the line of the adit), south of the drive on the Oriental reef. Assuming that the Oriental reef is vertical below the Australasia adit level, this adit should cut it at a distance of 3,730 feet from the adit mouth. The Front line and the Tributors' line, dipping west, should have been intersected some hundreds of feet nearer the mouth of the adit. At 3,757 feet from the adit mouth, a reef 1 foot wide, striking W. 43 deg. N., and dipping S.W. at 65 deg. was intersected; and at 3,790 feet, a fault striking W. 25 deg. N., and dipping S.S.W. at 73 deg. The country between this reef and the fault is soft, and carries a lot of water. I consider that the reef cut at 3,757 feet in the adit is the Front line of the Oriental reef, and that the reef has been faulted to the south-east, the Scandinavian line being the southern continuation of the Oriental line. No fault shows in the drives to the south on the Oriental workings, the fault line probably passing to the south of these drives. The evidence in support of the theory that the reef has been faulted, is as follows:—

(1) The Oriental dyke and reefs cannot be traced south of the Oriental gully, while the Scandinavian dyke and reefs cannot be traced north of it.

(2) Small detached pieces of dyke (shown on the plan) occur on the surface on what would be the line of the fault.

(3) At the Orient mine on the opposite side of the spur, but on the assumed line of the fault, a number of small faults occur, carrying the reef to the east on driving south.

(4) The direction of the fault at 3,790 feet on the Bright Prospecting Company's adit is parallel to the line joining the detached pieces of dyke on the surface.

(5) About 2,000 feet to the south of the Oriental workings, a fault has been proved with a heave of 290 feet in the opposite direction to that assumed to have taken place on the Oriental mine. A sketch of the faulting is shown below, the country between the two faults being displaced to the east :—

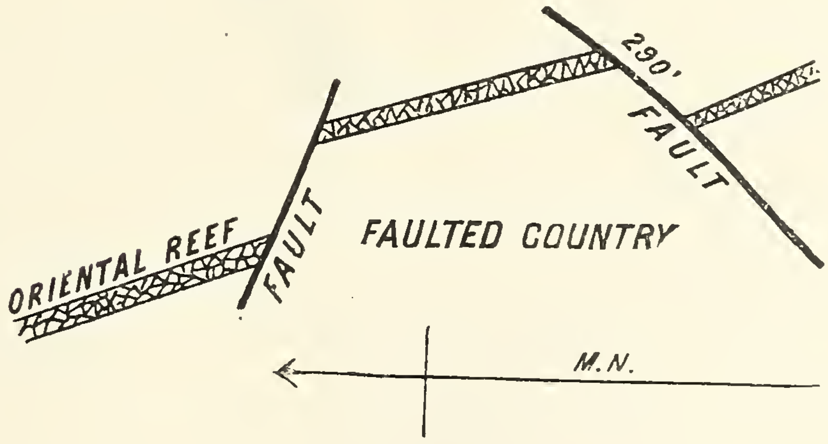


Fig. 42.

I consider that the fault on the Bright Prospecting Company's adit at 3,790 feet has faulted the reefs, and that no more reefs will be cut by extending the adit further, the position of the reef being as sketched below :—

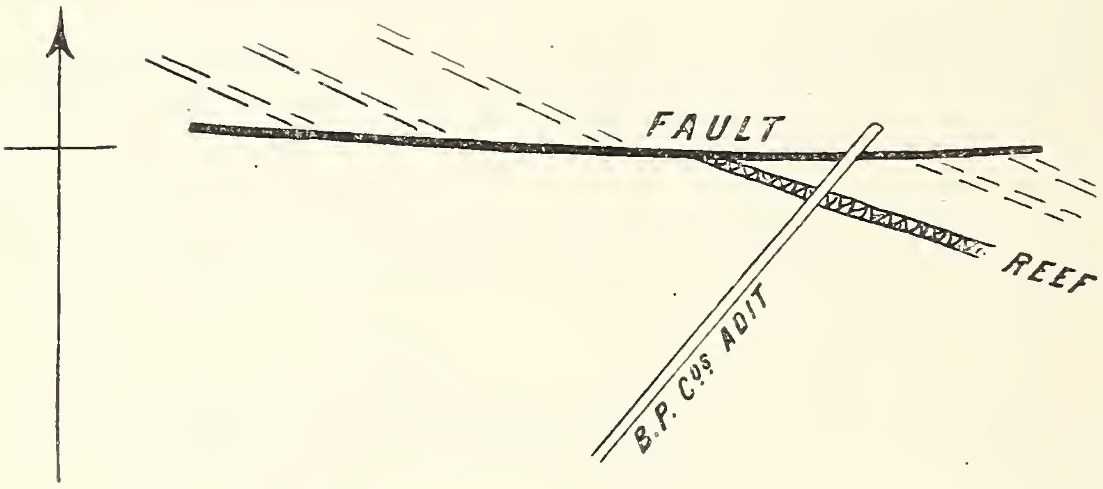


FIG. 43.

The Oriental line should be picked up by driving north along the fault or preferably along the reef until it meets the fault (about 70 feet), and then along the fault itself. The Oriental reef may be intersected about 100 feet from the cross-cut, but this distance cannot be estimated with any degree of accuracy, the depth below the old workings being so great.

In conclusion, I desire to draw attention to the value of the work being done by the Bright District Prospecting and Gold Mining Company, in proving the reef at a depth hitherto untouched in the locality. In a great many cases, reefs have been worked to a depth of 200 to 300 feet, and then abandoned owing to the stone becoming unpayable, no attempt being made at deeper sinking. The Bright Prospecting Company will prove their reef at a depth of 1,200 feet, and if payable stone is found at this depth, the result will be very beneficial to the field in general.

[*Report sent in 20.6.06.*]

THE NEW MOON REEF, WANDILIGONG.

By J. P. L. Kenny.

The New Moon Reef is situated on the spur between the Ovens River and the eastern branch of Growler's Creek, near the head of the latter.

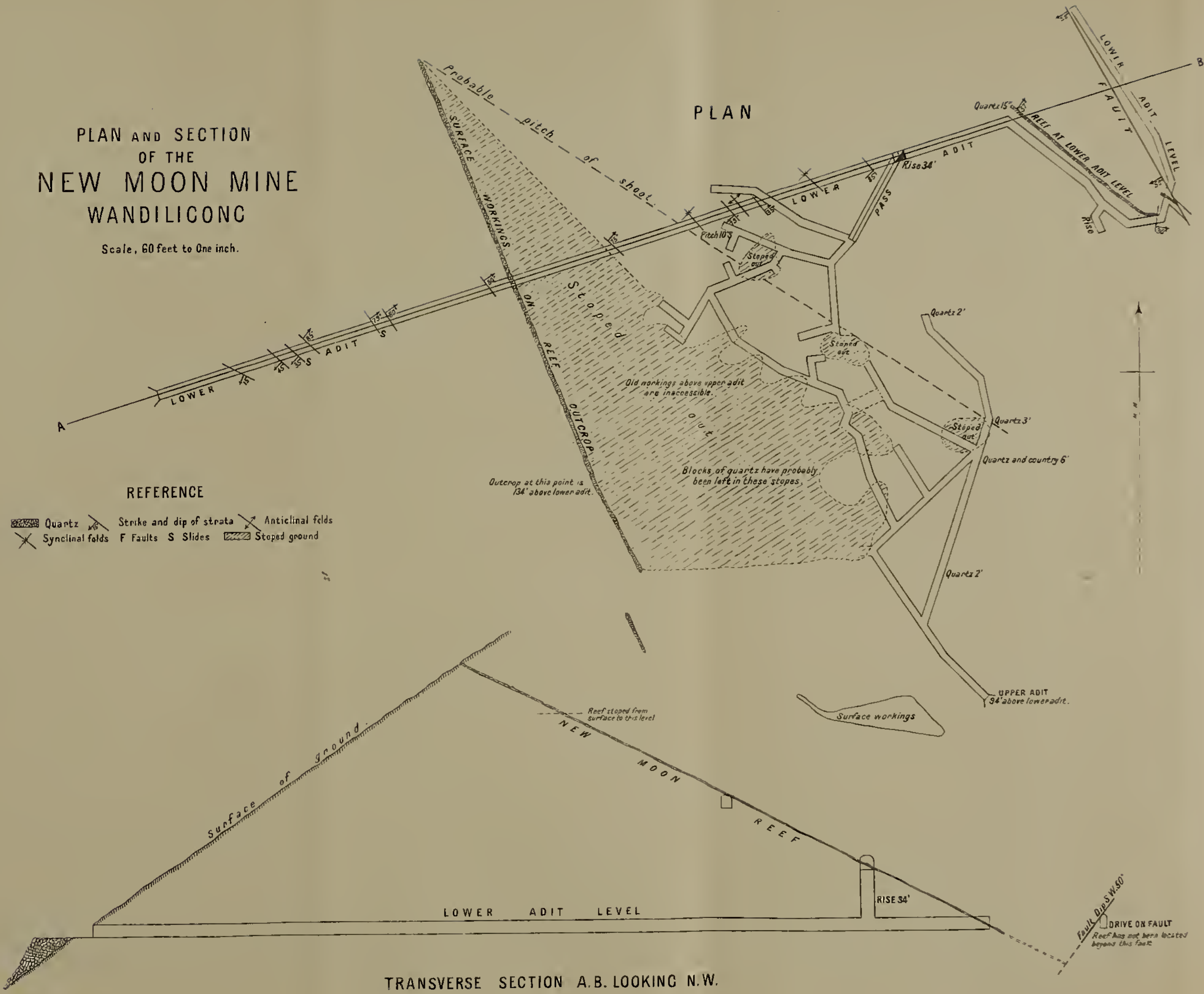
BRITISH MUSEUM
NATURAL HISTORY

PLAN AND SECTION
OF THE
NEW MOON MINE
WANDILICONC

Scale, 60 feet to One inch.

REFERENCE

▨ Quartz Strike and dip of strata Anticlinal folds
Synclinal folds F Faults S Slides ▨ Stoped ground



TRANSVERSE SECTION A.B. LOOKING N.W.

The reef was first opened up in 1870, and the recorded crushings are given below:—

Ore Crushed.	Gold Yield.	Depth from Surface.
tons.	ozs.	feet.
80	95	Surface.
45	113	,,
45	113	,,
90	144	40
964	532	50
180	35	70
100	9	Not stated.
15	13	25
15	28	Not stated.

This gives a total yield of 1,082 oz. of gold from 1,534 tons of quartz, an average of 14.1 dwts. per ton.

On the surface the reef strikes N. 23 deg. W.; and dips N.E. at 25 deg. A drive has been put in on the line at a vertical depth of 40 feet below the outcrop. Some stone has been taken out below this level, but most of the gold has been obtained from above it. The reef is from 1 foot to 6 feet wide, showing solid white quartz in some places and in others a brecciated formation.

Everywhere the walls of the reef are well defined. The quartz is well mineralized, carrying pyrites and galena. At a vertical depth of 94 feet below the drive an adit has been put into the reef. At 385 feet from the mouth of the adit a rise was put up and a connexion made with the upper workings. This adit cut the line of reef at a distance of 448 feet, the reef being 15 inches wide where intersected. A drive south was put in on the line, and at 112 feet from the adit, a fault striking N. 30 deg. W., and dipping S.W. at 50 deg., was met with. The fault has been driven on to the north for a distance of 110 feet, without picking up the continuation of the reef. At present a rise is being put up on the reef about 40 feet north of the fault.

The old workings, as far as accessible, indicate that the shoot is pitching to the south. The position of the lower adit has been badly chosen. It should have been started to the south of the old level instead of to the north of it. The drive north along the fault, if continued, will probably intersect the reef, but it is altogether to the north of the shoot.

The reef where faulted in the lower level carries a little gold, and colours of gold can be got in the pug on the fault above the reef. This would indicate that the fault is a normal one, and a rise on the fault would pick up the continuation of the reef. At present, however, the reef above the fault remains to be prospected.

The shoot is pitching south, and the drive in the lower level will have to be extended southwards to cut it. The line of junction of the reef and the fault pitches to the north, but the drive could be continued south about 60 feet on the reef, and a rise from this point should cut the continuation of the shoot worked above.

[*Report sent in 28.6.06*].

THE GAPSTED GOLD-FIELD, NEAR PALMERSTON.

By E. J. Dunn, F.G.S., Director, Geological Survey.

At Stony Creek a considerable amount of alluvial gold mining has been carried on. About half-a-mile east of the railway line is an interesting remnant of a high level Tertiary lead. It appears to correspond to the Newer Pliocene age. A few thoroughly rounded pebbles of quartz occur in the conglomerate but they are rare; most of the pebbles of quartz are either subangular or but half rounded, and many are angular. The highly rounded examples have no doubt been derived from a higher pre-existing Older Pliocene deposit. The soft sandstone and slaty pebbles and boulders are well rounded, some of these latter weigh up to 2 or 3 cwt. each. The gold is not very well water-worn; this hill has been sluiced for many years and occasional rich patches have been found, and it is still being worked.

At the north end of this hill a newer lead has been worked, and the bottom is about 60 feet lower than on the bottom on the hill. The material and the gold of the Newer Pliocene lead have been re-arranged to form the material of this lead, which is probably Post Pliocene in age. It is, however, not cemented into conglomerate as in the older lead. This latter lead may be classed as of the same age as the terraces that fringe the hills in this neighbourhood.

Still later are the recent gravels derived from materials that have been supplied by the Post Pliocene and Newer Pliocene leads. These gravels occur along the beds of the present water-courses and in the flats at lower levels than the terrace material. This recent gravel has been largely worked for gold, and some of this gold has doubtless been deposited first in the Older Pliocene lead that once ran through the valley but that has been quite removed, then it was deposited in the Newer Pliocene lead of which a remnant occurs in the capping of a hill previously referred to, afterwards it was deposited in the Post Pliocene lead, and last of all it reached the recent gravel. The gold of these gravels has certainly been derived from rocks that were at a much higher elevation than the present surface, and as the belt of auriferous rocks bearing productive reefs begins at the reservoir, the gold probably has been brought from that neighbourhood.

Auriferous Reefs.

The belt of reef-bearing country extends on its west side to the top of the reservoir, and easterly it is about 1 mile in width. The principal reefs within the watershed so far worked are the Home Rule, the Dublin, the Juvenile, the Wallaby, the Wombat, and none of these have proved to be of any great extent or to be very rich. It appears quite likely that the rocks at a higher level were a richer zone, and that these supplied the gold for the auriferous leads, and that the reefs in the present surface rocks are in a lower and poorer zone.

At Buffalo Creek, about 4½ miles in a direction a little east of south from Myrtleford, is Mr. J. Paull's small battery for quartz crushing worked by a water wheel.

Twenty chains westward from the battery the Northampton Reef cuts through slaty country. Strike of reef north and south; dip east at about 60 deg. The quartz is up to 7 feet thick in places. A crushing of 100 tons taken from the outcrop yielded about 1 oz. per ton. The shoot of gold pitches south, and a shaft was sunk to intersect it, but the gold had fallen off and nothing is at present being done on this reef. About 3 chains further up the gully a spur is being worked in very favorable looking greenish-grey slate, there are other spurs here carrying gold. Soil is of red colour.

The Sink or Swim Reef is about 3 chains east of the Northampton Reef and further northward. Very probably it is the continuation of that reef beyond a fault. Strike of reef N. 20 deg. W.; dip E. 80 deg. The quartz ranges up to 3 feet thick. Some crushings have been taken out with payable results. These reefs have not been worked to any depth.

The Mountain View Reef is about 10 chains west of the Sink or Swim Reef. Strike of reef N. 25 deg. W.; dip W. 70 deg. Thickness of quartz almost 2 feet. For a length of 300 yards along the outcrop, a considerable amount of work has been done many years ago. The country rock is yellow and grey sandstone and slate of favourable appearance. Soil red. The reef crosses the beds in dip. The country rock pitches southward and the shoots of gold pitch south also. This reef is not being worked at present. There are two tunnels into it.

The White Bell Reef appears to be the northward extension of the Sink or Swim Reef and is being worked by the Messrs. Paul. The outcrop is being opened up, and from one crushing of 20 tons 34 oz. of gold was obtained. Lower down a crushing of 15 tons of quartz yielded 9 oz. of gold.

There is a belt of auriferous country about 2 miles wide that runs between the Buffalo and Ovens River and that crosses the Buckland River. From this belt the extremely rich alluvial yields of gold that made the Buckland famous were derived.

In Mr. Woodside's paddock, Happy Valley, there is a strong and continuous outcrop of hæmatite. Mr. Easton is locating the positions of the reefs formerly worked in this district.

[*Report sent in 25.10.06.*]

THE CEDRIC AND SADIE LEASES, WANDILIGONG.

By J. P. L. Kenny.

The Sadie reef is situated on the eastern side of the spur between Morse's Creek and the Western branch of Growler's Creek. It strikes N. 33 deg. W., and dips to the east at 80 deg. The reef is a continuation of the Wallaby line, on which are also the London, Myrtle, and Redruth workings. The line can be traced northward from the London workings, but has not proved auriferous beyond them. In the Myrtle mine the reef has been worked to a depth of 800 feet below the surface. This is the greatest depth at which payable stone has been obtained in the Wandiligong district.

About a mile and a half south from the Redruth mine are the Wallaby workings. The reef here shows 3 feet of white quartz, with 4 inches of laminated quartz on the hanging eastern wall.

The Sadie mine is about 50 chains south of the Wallaby workings. The reef here dips to the west at 82 deg. Quartz spurs traverse the country to the east of the reef which is about 1 foot wide. An adit, length 210 feet, has been put in to the line, and the reef has been worked from the surface down to the adit level. To the north of the Sadie workings the reef has not been prospected beyond surface cuts. A drive north at the adit level would prove the ground in this direction.

The Cedric reef is situated near the top of the spur to the west of the Sadie reef. The footwall is well defined, and on the hanging wall quartz spurs make off from the reef into the country. The reef dips to the east at 80 deg. An adit, length 145 feet, has been put into the line, and just to the south of the intersection of the adit and the reef, a shaft has been sunk on the line. Forty-five feet east of the Cedric reef, another line was intersected in the tunnel. This line runs parallel to the Cedric reef, and has been driven on to the north for a distance of 70 feet. To the north of the Cedric adit, a lower adit, length 100 feet, has been put in. This adit would intersect the Cedric reef about 340 feet north of the shaft referred to above. The adit would have to be extended about 100 feet to cut the main Cedric line.

At a distance of 66 feet from the mouth of this adit, a diorite dyke 10 feet wide is intersected. The main belt of auriferous country in the Wandiligong district is traversed by similar dykes, running approximately parallel to the lines of reef. In some cases the reefs are directly associated with the dykes, quartz, often auriferous, occurring on either wall or in the dyke itself. In other cases in following along the line, the dyke disappears, a quartz reef taking its place. The dyke showing in the Cedric adit has not been traced either way. It traverses ground in which no mining has been done. The country in the vicinity of these reefs appears favorable for gold, and should repay further prospecting.

[*Report sent in 21.7.05.*]

ROSE, THISTLE, AND SHAMROCK MINE, HARRIETVILLE.

By J. P. L. Kenny.

The Rose, Thistle, and Shamrock mine is situated about 2 miles north-west of the township of Harrietville, near the head of Shamrock Creek. a tributary of the Ovens on the west side.

The main Shamrock reef has been worked along the surface for a distance of about 650 feet. It strikes W. 3 deg. N., and dips to the south at 62 deg. The strike of both the reef and the country rock is much more nearly east and west than is usually the case in the district. The general strike of the lines of reef is N. 30 deg. W. The Shamrock line is the only one of any length running nearly east and west. The reefs run approximately parallel to the strike of the enclosing slate and sandstone beds. At the face in the lower Shamrock tunnel which is about 60 feet from the line of reef, the country rock strikes W. 30 deg. N., and dips S.W. at 67 deg.

The outcrop of the reef cuts across the Shamrock Creek. The reef has been worked on the surface for a distance of 470 feet west from the creek. At a distance of 120 feet from the creek the line is cut off by a fault, the strike of which is E. 22 deg. N. The reef was intersected again after driving westward along the fault for about 40 feet. At the western end of the workings, the reef appears to be cut off by another fault striking E. 40 deg. N. and dipping S.E. at 62 deg. Several cuts have been put in beyond this fault, but all in the direction of the original line of reef. A piece of quartz showing gold was picked up a short distance to the south. It is probable that the continuation of the line will be picked up by driving south-west along this fault. The old workings on the Shamrock line included several shafts and a tunnel. All the workings on the line are now inaccessible, but the following particulars have been supplied by the manager, Mr. H. A. Higgs. The main shaft, known as the engine-house shaft, was sunk to a depth of 317 feet on the underlay of the reef. The old tunnel cut the reef at a depth below the mouth of the engine-house shaft of 130 feet vertically, or 147 feet on the underlay of the reef. From the end of the tunnel a drive west on the line was put in for a distance of about 480 feet to the western fault. Four shoots of stone were worked; lengths and widths being as follows :—

No. 1 shoot—Average length 40 feet—Average width 18 inches.
,, 2 ,, ,, ,, 70 feet ,, ,, 5 feet.
,, 3 ,, ,, ,, 40 feet ,, ,, 20 inches.
,, 4 ,, ,, ,, 60 feet ,, ,, 3 feet.

The engine-house shaft was sunk to a depth of 170 feet on the underlay below the tunnel level. At 100 and 170 feet, drives west were put in on the line for about 300 feet. The reef has been worked from the surface down to this 170-ft. level.

About 290 feet east of the engine house shaft another reef, the Landtax, junctions with the Shamrock line. At a distance of 50 feet from the junction this line strikes N. 20 deg. W., and dips to the east 55 deg. On nearing the Shamrock wall the reef turns westward in an arc of a circle and junctions with the Shamrock line. A shoot of stone 65 feet long on the surface was worked to a depth of 665 feet on the underlay of the reef by means of a shaft with an underlay of 33 deg. S.E. A tunnel was also put in on the line at the level of the Shamrock tunnel. The shoot was 5 feet wide and 43 feet long at the bottom of the shaft, and 4 ft. 6 in. wide at the surface. From the surface to a depth of 300 feet on the underlay this shoot gave an average yield of 2 oz. of gold per ton. Payable stone is said to have been left in the bottom of the Landtax shaft, the engines not being powerful enough to keep down the water.

From the Shamrock upper tunnel a drive east was put in to the junction of the Landtax reef. This drive passed through a payable shoot. In order to work the Shamrock and Landtax reefs to greater depths a lower tunnel was started in 1894. This tunnel is at a vertical depth of 348 feet below the upper tunnel or 478 feet below the mouth of the engine-house shaft. The tunnel was driven with the intention of cutting the Shamrock line at its junction with the Landtax line. The tunnel was put in for a distance of 2,214 feet, bearing S. 31 deg. 19 min. W. Four dykes shew in the tunnel running parallel to the strike of the country. These dykes are not associated in any way with the main lines of reef. The lower tunnel intersects the Landtax reef at a distance of 2,042 feet. The reef here is 4 feet wide, with two well-defined walls. The reef carries no gold at the point of intersection. It would be necessary to drive south-east along the line for about 150 feet to cut the continuation of the shoot worked above.

The lower tunnel was put in for a total distance of 2,214 feet without cutting the Shamrock reef. According to my survey the tunnel would cut the reef at another 60 feet. A small quartz reef had been cut 60 feet back from the face of the tunnel. This was taken for the Shamrock reef and a drive west was put in for a distance of 674 feet. This drive is not on any definite line. It follows the general strike of the country rock. As a result of the survey, a cross-cut south-west was put in from a point near the end of the drive. This cross-cut has now cut the reef at a distance of 135 feet from the drive. The reef varies in width from 3 ft. 6 in. to 7 feet and carries gold all through, being richest on the hanging wall side. The stone broken so far is estimated to average ½ oz. per ton. The hanging wall is very well defined and has a uniform underlay from the surface of the lower tunnel level. The quartz is laminated and well mineralized, iron and arsenical pyrites being present with a little galena. The drive is now in 33 feet from the point where the reef was struck, and the stone in the face still carries good gold.

Until the limits of this shoot are determined the pitch of the shoots cannot be fixed accurately. The present shoot is probably the most easterly of those worked above, the remainder will be intersected in driving west. The reef has every appearance of permanence in depth and promises well for the future of the mine as a gold producer.

[*Report sent in 25.8.05*].

THE BUCKEYE MINE, NEAR HARRIETVILLE.

By J. P. L. Kenny.

The Buckeye mine is situated about three miles west of the township of Harrietville, on the main spur between the Ovens River and Morse's Creek, at a height of 3,360 feet above sea-level.

The workings include two lines of reef which junction to the north, thus:—

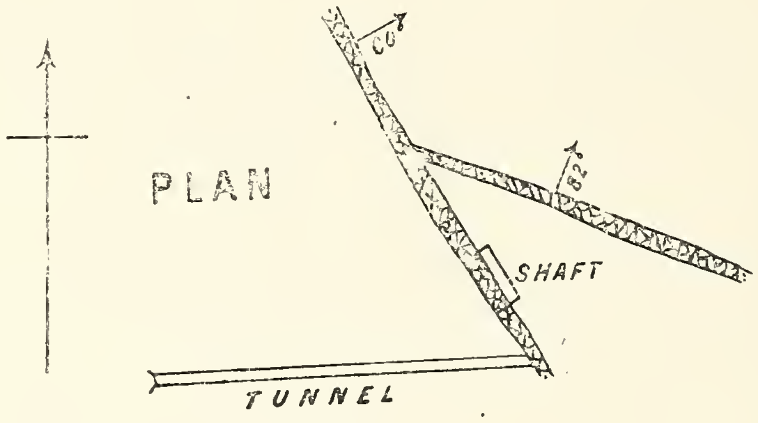


FIG. 44.

The Western line dips to the east at 60 deg. The Eastern line also has a dip to the east. The Western line follows approximately the strike of the strata which are dipping to the east at about 60 deg. in the vicinity of the reef. An underlay shaft has been sunk on the Western line to a depth of 480 feet. A tunnel cuts the line at a depth of 150 feet from the surface.

The reef was first opened up about 1878. A shoot of stone was located about 80 feet south of the junction of the reefs on the Western line. The shoot was 40 feet long on the surface, and was worked to a depth of 250 feet. Gold to the value of £20,000 was obtained, the last crushing of 600 tons yielding 1 oz. 5 dwt. per ton. When this shoot had been worked out, the mine lay idle for about twelve years. It was then taken up by Bromley and party, who had obtained a Government grant of £200. In driving north along the Western line they struck rich leaders going into the hanging wall. These were followed, and the Eastern reef was met carrying good gold.

This party crushed 108 tons for a total yield of 721 ozs. The property was then bought by the Buckeye Gold Mining Co.

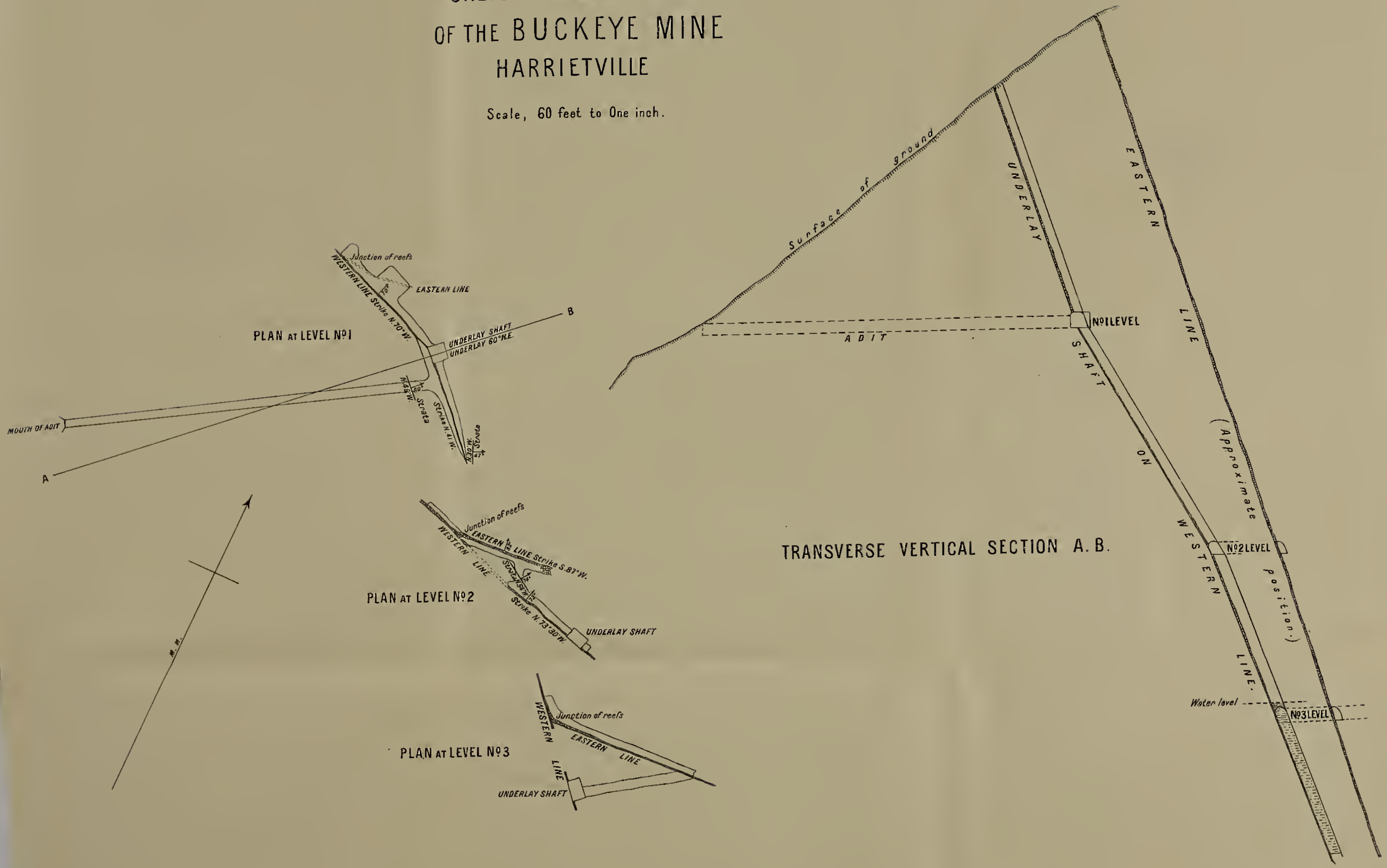
The company worked the Eastern line to a vertical depth of 350 feet.

The approximate area of ground stoped out is shown on the longitudinal section of the accompanying plan.

Three "makes" of stone were worked. The upper one was 10 feet long on the surface. At a lower level it widened out to 40 feet, and at a depth of 100 feet was again 10 feet long. The average width of the reef was 3 feet. Two other "makes" of similar shape were worked below this. The second had a maximum length of 60 feet, and an average width of 3 feet 6 inches. The third "make" was worked down to the

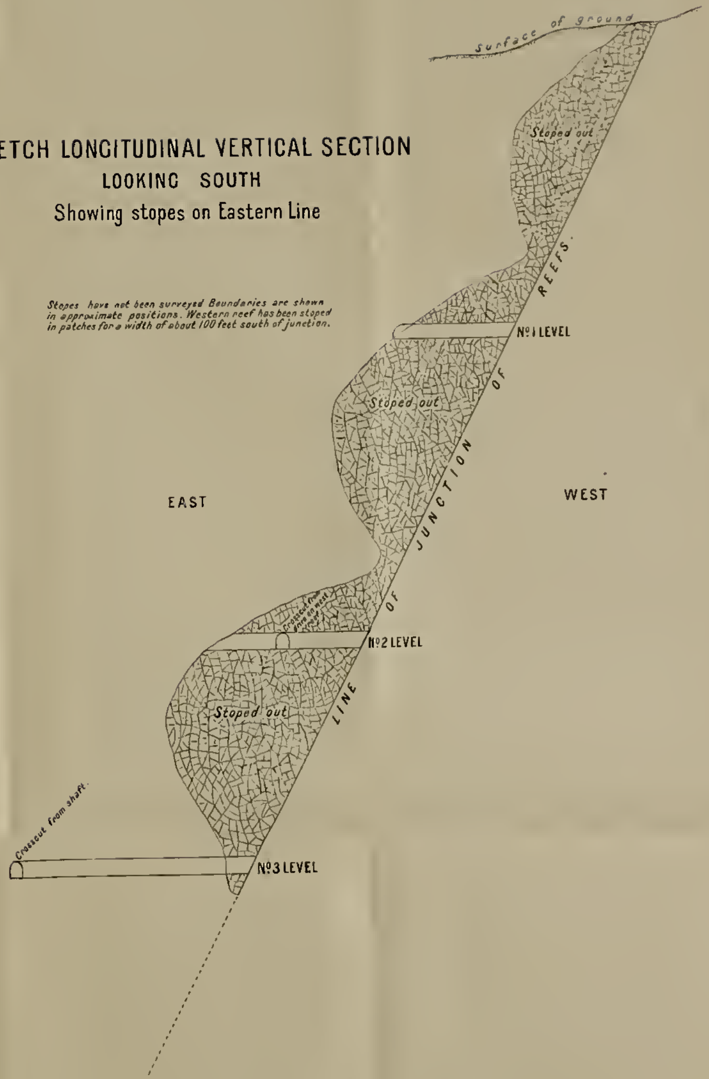
SKETCH PLAN AND SECTIONS
OF THE BUCKEYE MINE
HARRIETVILLE

Scale, 60 feet to One inch.



TRANSVERSE VERTICAL SECTION A. B.

SKETCH LONGITUDINAL VERTICAL SECTION
LOOKING SOUTH
Showing stopes on Eastern Line



Stopes have not been surveyed Boundaries are shown in approximate positions. Western reef has been stoped in patches for a width of about 100 feet south of junction.

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NATURAL HISTORY

No. 3 level. It had a maximum length of 73 feet, and an average width of 2 feet 6 inches. From this shoot 430 tons were crushed for a yield of 1,500 ozs.

These makes were worked east along the line until the stone pinched out. Beyond the area stoped out the line carried no stone.

When the third make of stone was worked out, the company ceased operations.

During the last six months three tributers, having obtained a twelve months' tribute, started to further prospect the mine. They found a new shoot on the Western line near the junction of the reefs. The first crushing of 38 tons gave 585 ozs. of gold, an average of 15 ozs. 8 dwts. per ton.

The "makes" of stone on the Eastern line were worked up to the junction with the Western line, and in places for 10 feet along it. The walls of the Western line show slickenslided surfaces, and it appears probable that this line has faulted the Eastern reef, which would be picked up again by driving north. The recent yield from this mine was obtained at the No. 2 level on the Western reef. This reef has not been prospected below this level.

The history and appearance of the mine justifies further development. There is very little water to contend with, the shaft having filled to a depth of 90 feet in two years.

When the mine was taken over by the company they purchased a battery on the Ovens River about 6 miles away. A considerable sum was expended in cutting a road from the mine to the battery. The cost of carting the stone to the battery was 13s. per ton. There is an old battery site below the mine. If a battery were erected here, and an incline or aerial tramway constructed, low grade ore, formerly unpayable, could be treated at a profit. As a rule the reefs in this district have been worked by tunnelling to a depth of 300 or 400 feet and then abandoned. The Buckeye reef could readily be tested to a greater depth, and if the shoots were proved to go down it would give a great impetus to the rest of the field.

[*Report sent in 9.5.05.*]

BASALT ALONG THE GIBBO RIVER.

By Reginald A. F. Murray.

I have the honour to report that I went to Benambra and thence to the Gibbo River with a view to tracing out the basaltic formation on and adjacent to the Gibbo River and the Mitta Mitta River.

In the first place, however, I saw the basaltic formation along the Morass (Murphy's) Creek commencing to show on the road about 5 miles northerly from Benambra, and on the Deep Creek some 4 miles further north, thence extending to the Gibbo River.

This basaltic area is correctly shown, as far as scale will allow, on the geological map of Victoria, and I understand that Mr. O. A. L. Whitelaw made a survey of its boundaries.

The first strip narrows upward along the Morass Creek to a termination some miles easterly from the road, so also does that along the Deep Creek. The two flows conjoin and form a plateau which extends in parts to the eastern side of the Mitta Mitta River and northerly to the southern side of the Gibbo River as shown on the geological map.

In the lower portions of their courses both the Morass Creek and the Deep Creek have cut their way deep through the basalt into the underlying Silurian rock. So also has the Mitta, and a long portion of the spur between the Mitta and the Gibbo towards its extremity is free from basalt. In my examination I had the advantage of the assistance and information of Mr. De Jarlais and Mr. Toland, both successful prospectors, who know every inch of the country and are well conversant with the general rock formations.

Of the source or sources of the basaltic flow, there appears no indication; it is as unknown as that of the similar older basalt flow of the Dargo High Plains.

From where the road comes down on the Gibbo, a short portion of the basalt plateau extends as a fringe about a couple miles up stream. It lies on the south-east side of the river some hundred feet above the water and flanking the slopes of the higher Silurian range at the back. An isolated remnant similarly occurs about 3 miles up, but beyond this, on either side of the river, not a vestige of basalt was seen by me, nor could I learn of any from the gentlemen abovenamed. There is a small patch of basalt on the north-west side of the Gibbo about 2 miles up from where the road comes down on the river, and a still smaller one on the north of the river between that point and the junction with the Mitta, but further continuity is broken down to the patch—2 or 3 miles below the junction on the east side of the Mitta—to which my attention was directed by Mr. E. J. Dunn. Owing to the difficulty of access on foot or horseback I did not go down to this patch, but can rely upon Mr. De Jarlais' information that it is only a short length of basalt some two or three hundred feet above the river, fringing the slope of the mountain behind, and underlaid in part by heavy gravel wash, a slipped portion of which Mr. De Jarlais worked but with poor results, while in the wash under the basalt he only got unpayable returns.

Down to the northernmost occurrence of basalt noted by Mr. Dunn, which De Jarlais recognised, he states that there are only a few insignificant vestiges of basalt.

There are various places where wash occurs under the basalt as at the furthest patch up the Gibbo and on the sides of the Morass Creek, but in no case where tested have they proved payable. In the Deep Creek, where it cuts into the Silurian, it is said that very small prospects of gold have been got, but nothing payable. The only chance for a portion of unbroken lead is under the basalt of the Morass Creek, and here, from all other evidence, the probability of payable gold being found is remote.

The conclusion I have arrived at is that the ancient lead covered by basalt ran down where the Morass Creek and Mitta Valleys now exist and was almost wholly eroded by the latter, so that the gravel contents were concentrated in the deepened river bed and nothing but flanking vestiges of basalt left remaining. As to the Gibbo I regard the basalt there as vestiges of an upstream flow for a short distance from the main one, very possibly up the old valley of the Gibbo, which has since cut its way to a deeper level.

Mr. Toland took me to the limestone belt on the spur between the Mitta and the Gibbo and showed me a small vein containing copper ore, not payable in size as now visible, but possibly indicating the proximity of a larger body; also a great lode of calcite in the Gibbo River containing somewhat sparsely disseminated galena.

Under the above circumstances it did not appear necessary to make a longer or more detailed examination; the rough facts observed appear sufficient for present purposes, and to make an exact geological survey would require the labour of an equipped party for some months with but meagre prospect of any public advantage accruing further than the additional scientific knowledge that might be obtained.

[*Report sent in 23.4.06.*]

Further Notes on the Gibbo River.

Since my former report I went up the Gibbo River for some miles and found no further occurrences of basalt above those already noted on the geological map, nor did I notice any rolled pieces in the river gravels and terrace washes to indicate the removal of basalts by denudation from further up the river valley.

In connexion with the alluvial gold workings up the river, I may state that portions of its bed and banks have been worked to my knowledge for fully 10 miles, if not more, from where the road from Benambra strikes the river, but from all accounts nothing very rich was ever found except perhaps in patches. Some years ago a race was cut and some of the high level or terrace gravels treated with the hydraulic nozzle, but, as stated, through some mismanagement the enterprise fell through, though fairly good prospects for that class of work were obtained. At the time of my last visit a scheme was in course of execution to construct a race that will from its delivery give sufficient force to work the bed and banks of the river upon the hydraulic elevator principle.

This work, if properly carried out, bids fair to be successful.

[*Report sent in 29.8.06*].

BLACK COAL HORIZONS IN VICTORIA.

By E. J. Dunn, F.G.S., Director, Geological Survey.

In this State there are two distinct and geologically widely-separated horizons at which black coal may be searched for. The upper and newer horizon is of Jurassic age, and one of the most widely diffused and characteristic fossils met with in these beds is *Tæniopteris Daintreei*. Sandstones, shales, and mudstones are the usual rocks, and interlaminated with them are seams of coal from a mere film to 5 feet in thickness.

It is in the Jurassic beds that coal has been worked extensively in Gippsland up to the present. In these beds also coal has been proved to exist at Apollo Bay and at Merino in the Western District. The total thickness of the Jurassic rocks is unknown, but it is probably more than 4,000 feet.

In New South Wales the Clarence River beds correspond to the Victorian Jurassics. In Tasmania, the coal-fields of the north-east appear to be of about the same age, and in South Africa the Stormberg series with the associated plant remains, including *Tæniopteris Daintreei*, also appear to represent the coal-bearing Jurassic beds of Victoria.

In all these cases the coal seams are recognised as belonging to the upper series or the *Tæniopteris* horizon.

There is an older coal horizon, separated in some cases by a great thickness of stratified rocks from the *Tæniopteris* horizon, and this is characterized by a more ancient flora, one of the most prominent forms being *Glossopteris Browniana*.

This lower and more ancient horizon is also characterized by thicker seams of coal and generally by coal of better quality.

In New South Wales the coal seams of Bulli on the south coast and Ashford near the Queensland border on the north are of great thickness, and they occur associated with a glacial conglomerate and with a flora of which *Glossopteris* is a prominent feature. In South Africa the thick coal seams, so extensively worked at Vereeniging and elsewhere, occur also associated with the Dwyka conglomerate, which is of glacial origin; and there also *Glossopteris* is prominently represented in the fossil flora. So that in all these cases the coal seams belong to the *Glossopteris* horizon. Between the *Tæniopteris* coal seams of the Stormberg and the *Glossopteris* coal seams of Vereeniging there are represented many thousands of feet of stratified beds, and the lapse of time between the two coal depositions must have been of vast duration.

In Victoria, besides the *Tæniopteris* horizon, in which all the coal seams at present worked are found, there also exists at Bacchus Marsh a *Glossopteris* flora associated with a glacial conglomerate, and, considering the parallelism in so many respects between the horizons in Victoria and New South Wales and South Africa, there seems to be a possibility that in addition to the *Tæniopteris* coal seams already known and worked there may also be *Glossopteris* coal seams which have yet to be discovered and which may underlie the Jurassic rocks of the State. In boring operations these possibilities should not be lost sight of.

[*Report sent in 6.8.06.*]

GEOLOGICAL BOUNDARIES IN THE WOORI YALLOCK BASIN.

By J. Easton.

The accompanying plan shows the boundaries traced out in the Woori Yallock basin.

It will be noticed that the volcanic area to the north of the Monbulk settlement is separated from the main Dandenong mass by a narrow strip of Silurian and has no connecting neck as shown on the geological sketch map of Victoria.

This area is practically confined to the Wandin-Yallock parish, and produces a dark chocolate coloured soil, with very little rock outcropping, except at points shown on plan.

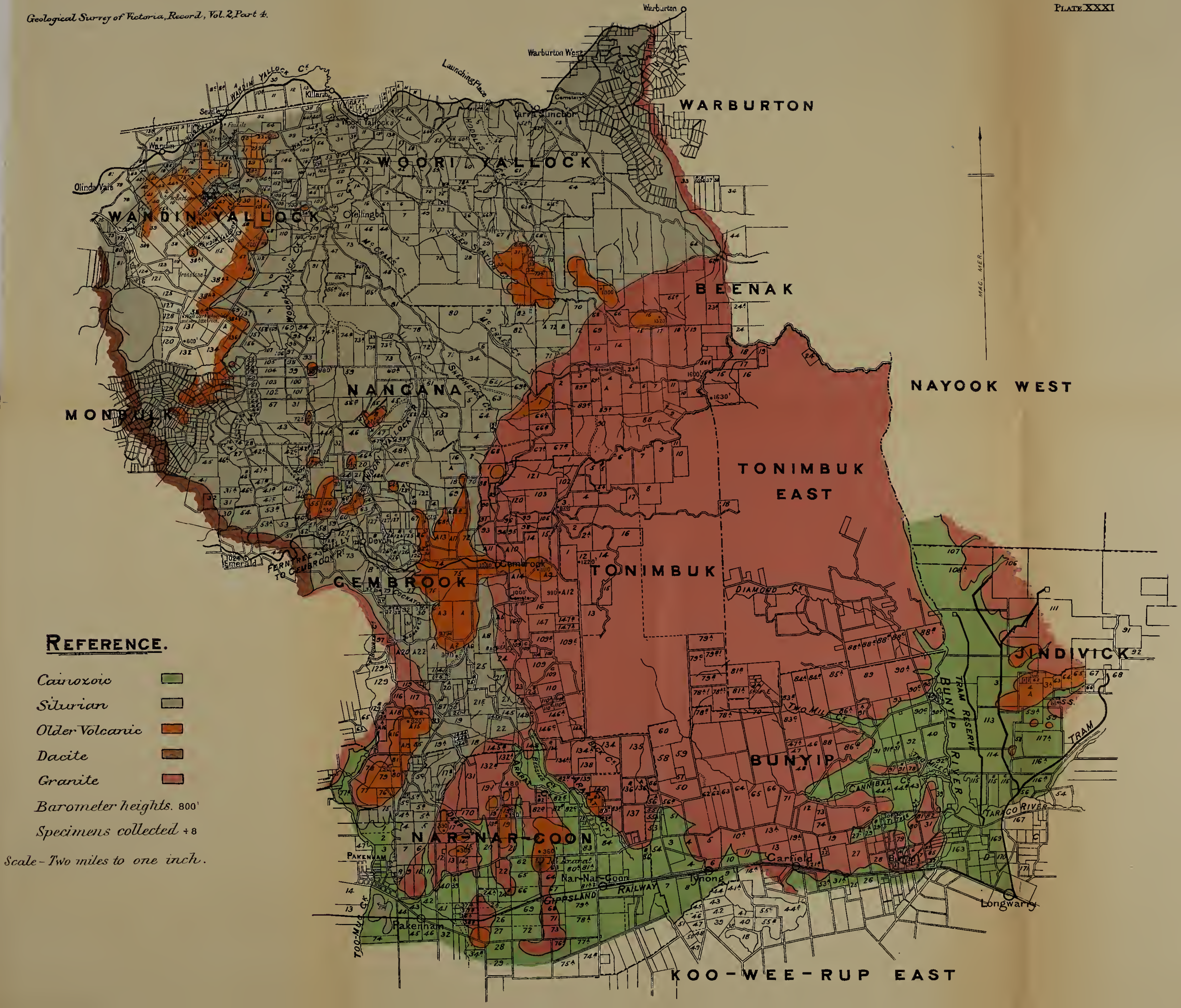
The greater part of this area consists of older basaltic rocks, but owing to the scarcity of rock exposures in the south-western portion, I cannot be sure that some of it may not be related to the dacites, for on the Olinda Creek, on the western boundary, I obtained a few boulders of dacite.

Several wells have been sunk in the vicinity of South Wandin, but I could not get any solid rock from the *débris* thrown out of them. The deepest well that I saw was in allot. 131, Wandin Yallock. I was informed that it is about 100 feet in depth; the material from this well was used to make up a portion of the garden, and appeared to be very similar to the surface soil, being chocolate coloured, with a small quantity of lighter coloured material intermixed.

Ironstone occurs in different parts of the area, as shown on plan.

Geological Survey of Victoria, Record, Vol. 2, Part 4.

PLATE XXXI



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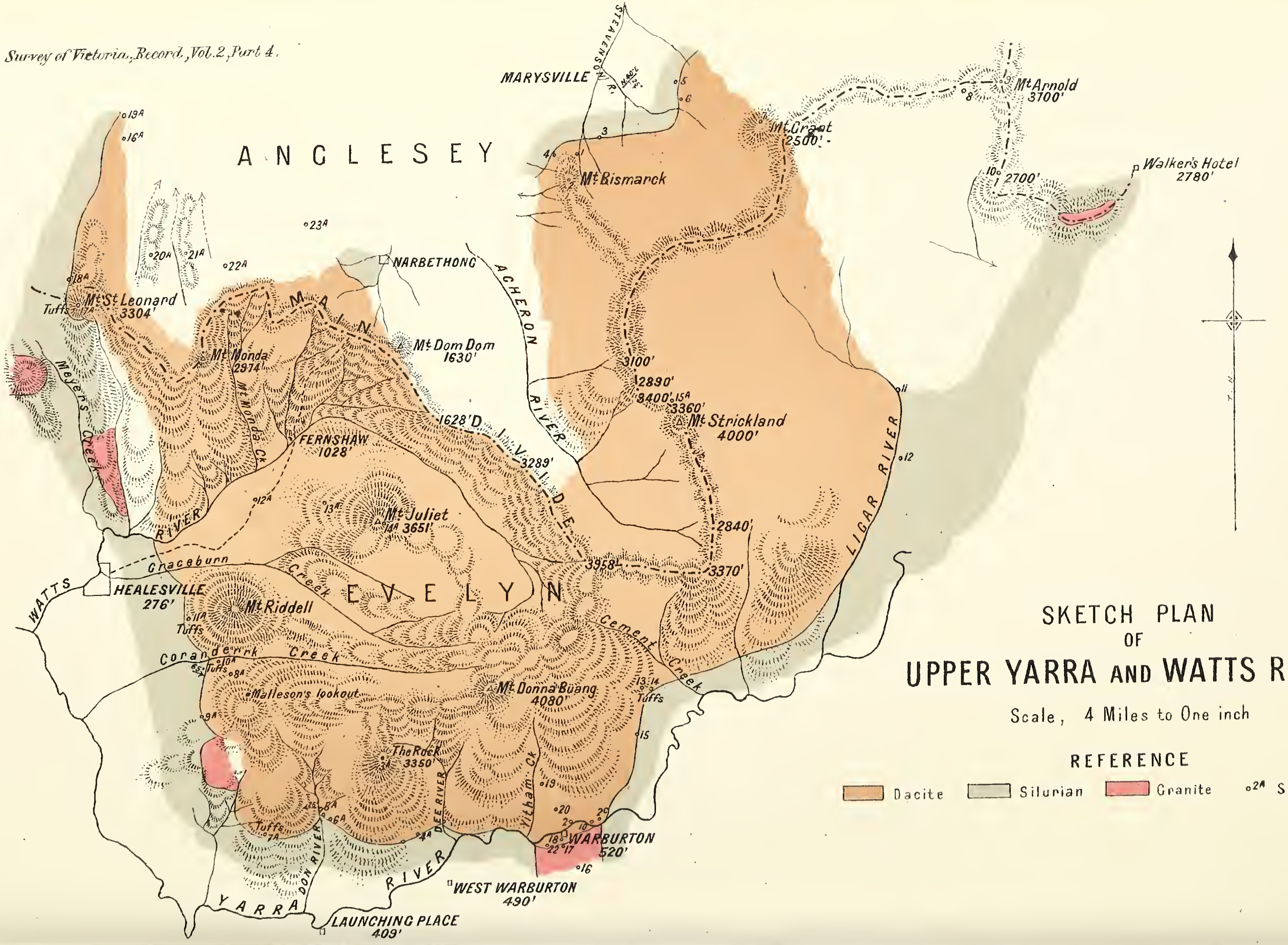


SKETCH PLAN
OF
UPPER YARRA AND WATTS RIVERS

Scale, 4 Miles to One inch

REFERENCE

At the points marked by crosses, boulders of cemented river-wash are to be obtained in the surface soil at the contact of the basalt, and are evidently the remains of an old water channel, which has been filled by the basaltic flow.

I also crossed over a portion of the Dandenong dacites, between Olinda Vale and Monbulk settlement, and endeavoured to find any traces of the occurrence of any Silurian inliers, but as I was unsuccessful, and could not hear of any indications from residents familiar with the locality, I do not think there are any in this portion of the mass.

[*Report sent in 14.8.03.*]

BOUNDARIES OF FORMATIONS BETWEEN THE HEAD OF THE ACHERON AND YEA RIVERS AND THE YARRA.

By J. Easton.

The following observations were made during a rapid delineation of the geological boundaries of the area of igneous rocks occuring between the head waters of the Acheron and Yea Rivers on the north, and the Yarra River on the south.

This area is situated in portions of the counties of Evelyn and Anglesey, and includes several prominent mountain peaks such as St. Leonard, Monda, and Strickland, on the main divide, and, south of the divide, Mounts Juliet and Donna Buang. The last-named is 4,080 feet in height, and is the highest point within the area.

The boundaries of the formations, so far as I was able to determine them, are shown on the accompanying sketch plan.

These boundaries, in many places, are only approximate, as I was unable, in the limited time at my disposal, to traverse the whole of them. Portions of this area are covered with such a dense undergrowth that in places it is almost impenetrable.

The formation which is termed trap on the Geological Map of Victoria, and referred to and described in sundry reports as plutonic and allied to the granites, has recently been shown to be a dacite by Prof. J. W. Gregory, D.Sc., F.R.S., in his paper on the geology of Mt. Macedon. This mountain he considers to be an allied mass, probably the remains of a Mesozoic or early Cainozoic volcano.

In lithological characters these rocks vary from finely crystalline dacite in such places as the Blacks' Spur, Warburton, Ligar River, &c., to more coarse-grained biotite-dacite at Mounts Juliet, Strickland, and the Rock. At Mt. St. Leonard it is more porphyritic, and is made up of fairly large crystals of quartz and felspar in a dense ground mass. Near the Yarra River, about 1½ miles above Warburton, and to the west of the Dee River (see 2A and 4A on the sketch map), I obtained samples of trachy-phonolite, but it would be impossible to define its extent without a more detailed examination .

Tuffs also occur at several points (see locality plan). and generally rest on the Silurian rocks near the edge of the dacite. The best section of these tuffs is shown on the Don road, between Healesville and Launching Place, on the south side of the Coranderrk or Badger Creek, where they can be seen for a distance of half-a-mile along the road cutting, and resting on the Silurian strata which are dipping under them at an angle of about 65 deg. in an easterly direction, and do not appear to be in any way affected by the close proximity of the tuffs and dacites. The tuffs at this point, and also at the south-west boundary of the area, are composed of rounded and angular fragments, ranging up to several inches in diameter, and consisting principally of fragments of a porphyritic structure, some having the appearance of Silurian fragments; these are embedded in a finer matrix. The tuffs shown to the west of Cement Creek are of a finer material.

The Silurian slates, shales, and sandstones, do not appear to have been altered along the contact, except in a few localities where a granite mass is usually found in close proximity. In the bed of the Don River, a short distance from the saw-mill site, hard indurated Silurian sandstones are to be seen dipping to the west at an angle of about 25 deg. with the dacites on both sides of the river apparently overlying them.

The Silurian strata in the vicinity of the granite bosses shown to the north of the Watts River are considerably indurated.

In the Acheron valley the Silurian formation extends for about 4 miles to the south-east of Narbethong, but I did not have an opportunity of filling in this contact.

Several small granite bosses occur in close proximity to the dacites. One small patch lies on the east side of the Ligar River, and is intersected by the race cut for mining purposes. At Warburton a granite contact occurs, and another to the south-west of the area in the parish of Gracedale. To the north of the Watts River are shown portions of two small bosses, one of which has been described by Mr. Selwyn on his sketch plan as a hornblendic granite passing into a porphyry towards Mt. Monda. The second mass is shown to the west of Meyer's Creek, and extends in a westerly direction towards the New Chum Creek, and has not been previously noted on any of the geological plans. A much larger area of granite exists to the north in the watershed of the Murrundindi Creek, but owing to the extremely rough and inaccessible nature of this country, no information is obtainable. An examination of the ranges towards the heads of Britannia Creek, to the south of Warburton, failed to reveal any dacite. The rock all appears to be granite.

The soil formed by the decomposition of the dacites is generally of a rich chocolate colour, and is in many places of considerable depth. It supports a dense and luxuriant flora, consisting of mountain ash, gums, wattles, musk, blackwood, native beech, sassafras, dogwood, ferns, and a varied assortment of small shrubs.

In conclusion I beg to state that, in my opinioin, the evidence so far obtained, tends to support Professor Gregory's opinion, that this mass is the result of volcanic origin.

Owing to the total absence of any more recent geological formations in the locality, it is impossible at present to form any idea of the age of the dacites, except that they are post Silurian.

[*Report sent in 16.10.03.*]

DIAMOND DRILL BORING IN SEARCH OF SADDLE REEFS.

By E. J. Dunn, F.G.S., Director, Geological Survey.

The experiment of boring on the anticline in search of saddle reefs, as carried out on Mr Hill's lease at Bendigo, has clearly established the suitability of this method of prospecting.

In carrying out such work it is necessary to take certain precautions and to have a grasp of the rock structure at the proposed site. The ideal site for boring in search of saddle reefs along an anticline (centre country), is where the dip to E. and W. is away from it, and also where the pitch to N. and S. is away from the site. The reason is that at that particular point the lowest beds are brought to the surface and the drill hole will from the surface downward be penetrating strata that are not exposed at the surface. It is not necessary to bore the beds that are stratigraphically above such a site, because by traversing them alongside the anticline any saddle reef existing would be exposed at the surface.

The site must be on the centre-country or anticline, and not at the side of it.

At Bendigo, the general inclination of the anticlinal plane is eastward, and to the extent of about 10 feet per 100, that is to say, if a shaft is sunk in centre country at 100 feet deep, centre country will be about 10 feet E. of the shaft, and at 1,000 feet it will be about 100 feet E. of the shaft. This rule does not hold good everywhere, but varies according to locality. At Chewton the inclination of the anticlinal plane is slightly to the W. as shown by the natural section on the hill south of Chewton, and also in the shaft of the Francis Ormond workings, where centre country is on the W. side of the shaft and nearer the shaft at the surface than at the 1,250-ft. level.

The boring must be regulated according to the inclination of the anticlinal plane. At Bendigo the drill was placed at an angle to give 10 feet of easting in every 100 feet of depth. At Chewton the inclination would be to the W. at about 3 deg., and so, in each locality, the local circumstances have to be studied and allowed for.

With such precautions the diamond drill affords a cheap and rapid method of locating saddle reefs, and performs, in months, work in prospecting that it would take years to accomplish by means of shafts, and at a fraction of the cost.

[*Report sent in 3.12.06.*]

REPORT ON THE MINERAL RESOURCES OF EAST GIPPSLAND.

By E. J. Dunn, F.G.S., Director, Geological Survey.

A belt of country rich in ores of gold, silver, copper, lead, tin, iron, and manganese exists between Bairnsdale and the Snowy River. The southern exposure of this tract is in a line drawn through Tambo and Nowa Nowa. Northward it stretches to the Murray River.

Eastward from the Snowy River to the New South Wales boundary is a tract of country in which payable gold has been discovered at several localities; copper and silver lead ores also occur in it.

GOLD.

Both alluvial and reef gold occur at several localities, as Mount Tara, the Bemm River, Club Terrace, Bonang, Bendoc, Boulder Creek, Cabbage Tree Creek, Genoa Creek, Mallacoota, &c. In many cases rich yields have been obtained, but the inaccessible character of the country has, no doubt, hampered prospecting operations. When the country is opened up by roads other discoveries may be expected.

SILVER.

Silver occurs at several sites, as South Buchan, Back Creek, Buchan, Murrindal, Gelantipy, Mount Deddick, &c. It is generally associated with galena. There are promising lodes carrying silver that cannot be opened up until better access is provided. Generally it exists in the Lower Devonian rocks.

COPPER.

Ores of this metal are met with at Buchan, Mount Tara, Accommodation Creek, and elsewhere. Probably many localities exist that will only be searched for when there is a prospect of working such ores at a profit. Very little has been done so far in opening out the copper sites discovered.

LEAD.

Galena is the most usual ore, and is met with at Back Creek, Buchan, Murrindal, Mount Deddick, and many other localities.

TIN.

Cassiterite occurs north of Bruthen, but nothing very valuable has been so far discovered. Further search should be made for this very valuable ore.

IRON.

At Nowa Nowa, the largest deposit of iron ore (hæmatite) known to occur in the State exists. About 8 miles further north is the "Iron Mask," another extensive deposit of manganiferous iron ore that covers an area of about three acres. At present it is being worked for manganese ore. Several other deposits of iron-ore of less magnitude occur in the vicinity of the "Iron Mask," and between it and Nowa Nowa. Mr. Jenkins reported very favourably on these.

MARBLE.

A deposit of marble that is but little known has been found about 25 miles north of Orbost, and has been brought under notice by Mr. James Cameron, M.L.A. At Buchan it covers many square miles.

BARYTES.

Very considerable quantities of barytes occur at Buchan, Mount Deddick, and at other sites. As it is largely used in the arts, it should become of economic importance when the cost of transport is reduced.

As East Gippsland becomes more accessible, and the cost of transport becomes reduced, further attention will be directed to the various ores, rocks, and minerals that await the prospector and miner in this region.

[*Report sent in 23.10.06.*]

OBSIDIAN BUTTONS.

By E. J. Dunn, F.G.S., Director, Geological Survey.

While at Ararat I saw in the local museum some examples of obsidian buttons, and was informed that they were of common occurrence at the south end of the range which runs to the west of the town. The end of the range is known as Rocky Point, and many of these buttons are reported to have been found in the wash-dirt. Similar buttons have been frequently found in the auriferous wash-dirt at Mt. William. They are found widely dispersed in the Mallee country in the north-west of this

State, in South Australia as far north as Charlotte Waters, and in Tasmania, and they were found to be plentiful in Central Australia by Professor Spencer, C.M.G., on his transcontinental trip, and Professor Gregory found them on his trip to Lake Eyre, and in Western Australia around Coolgardie they are numerous.

These Obsidian buttons, &c., which are black by reflected light and light-grey and transparent in thin sections by transmitted light, occur laterally over a wide expanse; vertically they also have an extended range. They are found on the surface on the top of the Grampians at 2,000 to 3,000 feet above the general surface of the country. At Mt. William high up in the range they are found in the recent auriferous gravels from a few inches to 30 feet below the surface. At Rokewood they are found in auriferous gravels below basalt.

In shape these interesting objects may be arranged in a few classes. 1st. Those that are much longer than broad, and that are contracted in the middle; 2nd. buttons or discoidal forms; 3rd. stopper-shaped examples, the sides somewhat tapering, and the discs much thicker than in the buttons. The long variety seldom exceeds 3 inches in length, and generally does not exceed 1 to 2 inches. The buttons are rarely 1 inch across, and more commonly are from $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter. The stopper-shaped ones are in some cases $1\frac{1}{2}$ inch across, and up to 1 inch thick. There is a very common feature about them, in that there are chips and flakes detached from them, especially in the case of the stopper-shaped examples; but frequently also in the other varieties. This feature is often masked by sand wear, where they have lain on the surface, or by attrition, where they have been in gravel deposits. One very unusual form in the National Museum collection has been cut in two to show its structure. It consists of a hollow sphere about 2 inches in diameter, dull on the outside, but brilliantly polished on the inside. It is, in fact, a glass bubble with thick walls. Around the periphery is a peculiar rim, and this will be explained further on. A spherical example from near Charlotte Waters which Mr. H. Y. L. Brown, Government Geologist of South Australia, presented to me, on being cut through shows a highly polished interior divided by a diaphragm, an instance of a double bubble. The step-like character is exhibited in a modified form on the outer edge of the buttons, and in some cases on the outer edge of the examples contracted in the middle. When these objects are found at the surface this edge, often quite sharp, is uppermost. Small rings perfect in form are also found; they are caused by the rim becoming detached from the central portion of the button. The stopper-like forms are the central portions of the buttons.

To account for their wide lateral dispersion and for their presence on mountain tops, as well as deep in the valley gravels, many theories have been suggested, such as their transport by emus, by aborigines, &c. Again, others have endeavoured to explain their presence at such varying altitudes and over such wide areas by attributing them to a meteoric origin.

The theory of dispersal by means of birds or human beings would scarcely account for their presence in some of the auriferous drifts, and there does not appear to be any need for invoking a meteoric origin.

A simple explanation will account for their forms, their substance, and their remarkable dispersion, and it is this.

These bodies represent the "blebs" of obsidian bubbles. From the Eocene period to recent times volcanoes were in active operation in Australasia. In Victoria there was remarkable activity. During these outbursts bubbles of glass of varying size were formed in the vents, and were carried up by the ascending heated gases to great heights. The bubbles were dispersed according to the direction of the wind, and in a few hours may have been carried for hundreds of miles. As they cooled they would fall towards the earth, and either the act of coming in contact with the rocks or the differences in temperature would shatter the frail glass bubbles, but the bleb which had formed at the bottom would remain. Chips would fly off on changes of temperature just as they do from slag or unannealed glass, and this has taken place. The buttons are the blebs of single bubbles, hence their symmetry. Around the edges of these the rim, when the glass bubbles break away, is often plainly visible. The examples contracted in the middle are the blebs of double bubbles, hence their peculiar form, and around the edge of these the rim where the bubble was firmly joined to them is apparent in some cases. The stopper-like bodies are blebs of a heavier class, and around their edges the line where the bubbles joined them appears to have chipped off. In the case of the remarkable hollow sphere previously referred to, it is the bleb of a large glass bubble, and the step around the periphery marks the line where the bubble joined this hollow bleb. The dispersal in greater abundance over some tracts would indicate the prevalent direction of the wind as well as the direction from which they were derived. These bubbles were undoubtedly blown in volcanoes. Whether these volcanoes are the points of eruption so common over the southern portion of Victoria or not, has yet to be determined. The analyses made of them show over 70 per cent. of silica, and in this respect they differ widely from the basic lava flows, but the bubbles may have preceded the lavas. Examples are found that are waterworn in the alluvial drifts of Victoria, and that are sandworn at Coolgardie, Western

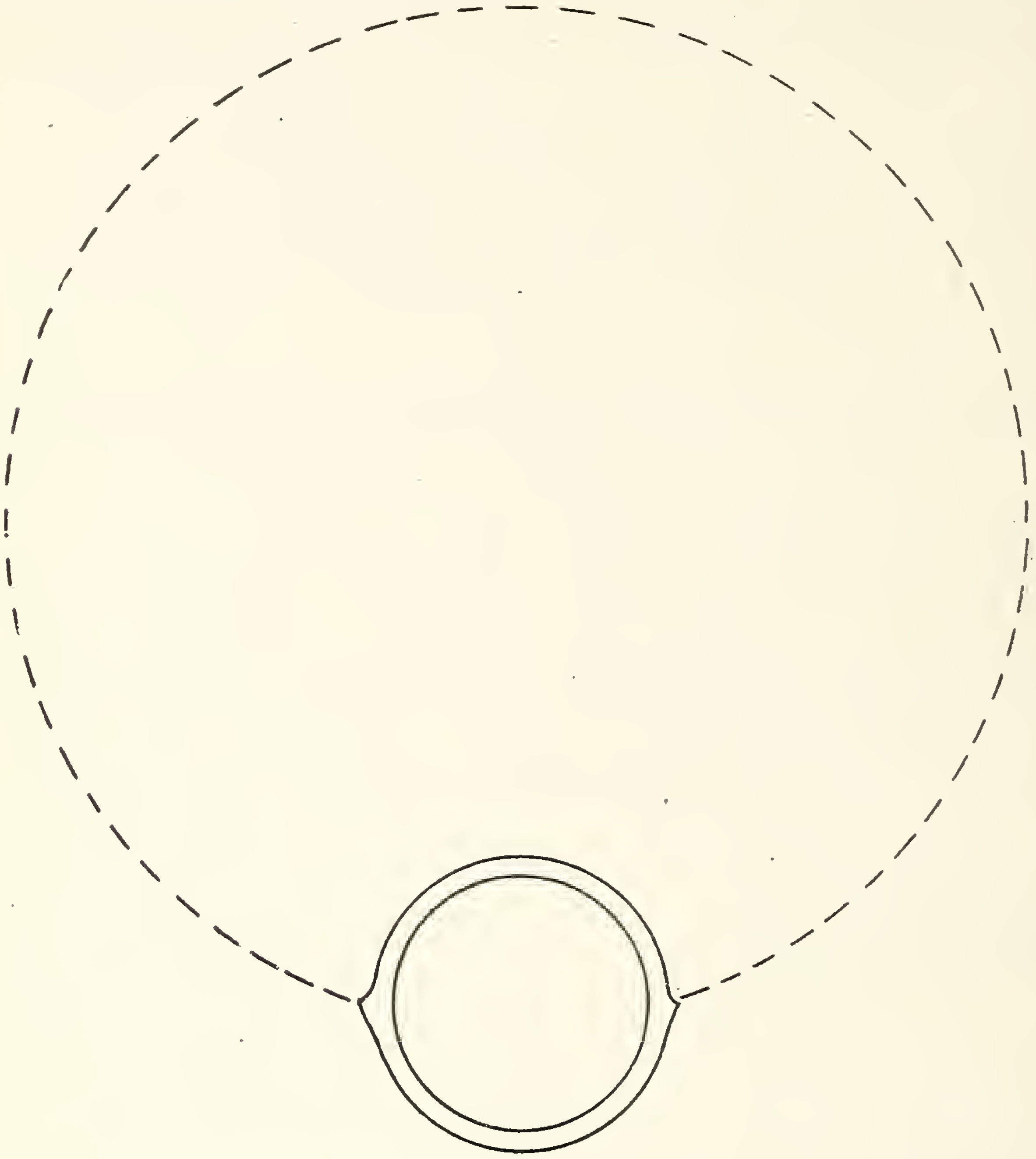


FIG. 45.

Section of a hollow obsidian button showing its relation to the original bubble (dotted circle).

Australia, and in the interior of Australia. It will be a matter of extreme interest to keep a chart of all the localities in which these bodies are found, and also as to their abundance over certain tracts. Every scrap of information on these matters should be recorded.

Mr. D. J. Mahony, M.Sc., has examined a thin slice of one of the bombs, and found it to be an isotropic glass with no trace of the formation of crystals.

The following report has been made by Mr. P. G. W. Bayly, who made a chemical examination at the departmental laboratory of some obsidian buttons from Coolgardie presented by Mr. Ward, Assistant Government Geologist of Tasmania:—

The sample consisted of six small obsidian bombs of the typical shape as found in Australia—button and mushroom shape.

Before crushing, the bombs were scrubbed with dilute hydrochloric acid to remove the ferruginous clay which filled the small pinhole depressions on the surface.

ANALYSES.

	A.	B.	C.
SiO_2	70·62	69·80	75·46
Al_2O_3	13·48	15·02	11·27
Fe_2O_3	0·85	0·40	1·17
FeO	4·44	4·65	2·05
MgO	2·42	2·47	0·27
CaO	3·09	3·20	0·53
Na_2O	1·27	1·29	3·45
K_2O	2·22	2·56	4·88
H_2O + (above 110°C)	0·01	not estd.	0·28
H_2O − (110°C) ...	0·06	not estd.	0·07
CO_2	nil	—	nil
TiO_2	0·90	0·80	0·50
P_2O_5	nil	nil	nil
SO_3	trace	?	trace
Cl	trace	—	trace
MnO	0.42	0·18	trace
NiO	trace	?	—
CoO	trace	—	—
Li_2O	trace (strong)	good trace	trace (spectroscopic)
SrO	—	nil	—
BaO	—	?	—
	99·78	100·37	99·93
Specific Gravity ...	2.454	2·454	(grey) 2·353 (greenish) 2·405

A. Obsidian buttons from Coolgardie, West Australia, collected by Mr. Ward, and analyzed by Mr. P. G W. Bayly.

B. A small button from the Upper Weld, Tasmania, collected by W. H. Twelvetrees, Esq., Government Geologist of Tasmania, and analyzed by Dr. Hillebrand, of the U.S.A Geological Survey. See Report of the Secretary for Mines (Tasmania) for the year 1905.

C. bsidian from the volcanic formation at Hauraki Gulf, New Zealand. Collected by Mr. E. J Dunn, and analyzed by Mr. P. G. W. Bayly. Inserted for comparison with the analyses of the obsidian buttons.

A comparison of the two analyses A and B shows a remarkable similarity, and indicates that the materials were of the same composition. The greatest difference is in Alumina 1.54 per cent (+) and Silica 0.82 per cent. (−); otherwise the figures are singularly alike. The specific gravities are identical.

The analysis was performed with all the precautions laid down by Dr. Hillebrand and were complete before the Tasmanian report came under my notice.

In a note discussing his own figures, Dr. Hillebrand says "there is probably some error in the value given for one of the larger constituents since the summation is in excess of 100, even without the water which in all probability is present."

In the present analysis the same remark applies, except that the error is on the minus side, and would probably bring up the alumina figure as that is determined by difference in the usual manner. The summation (99.78 per cent.) is, however, quite within the range of safe work.

PLATE XXXIII.

Obverse Side.

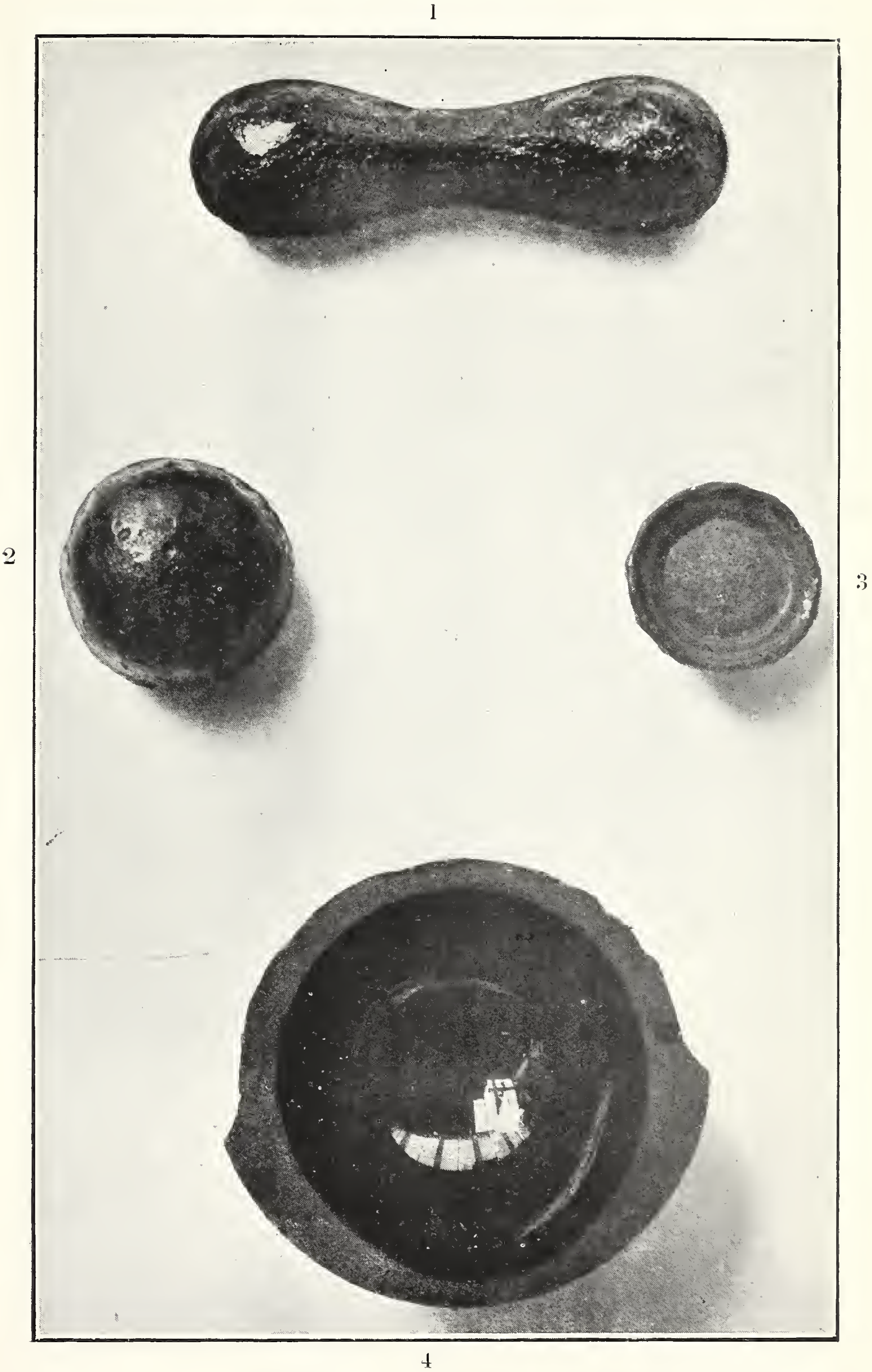
Fig. 1.—Represents a dumb-bell form. This is considered to be the "bleb" formed by two bubbles of obsidian coalescing. The surface represented would be uppermost as the bubble floated, and it would therefore be inside the bubble, which would be attached around the periphery. From Mackenzie Creek, Horsham.

Fig. 2.—Represents a bleb of a single bubble which was originally like Fig. 3, but much larger and thicker. The thin rim which surrounds Fig. 3 has flaked off, leaving a stopper-like form slightly bevelled where the flakes have split off. From Coolgardie, Western Australia.

Fig. 3.—This is a bleb resembling a button in form. The rough margin is where the single bubble was attached to it. In blowing ordinary bubbles frequently a bleb forms at the bottom, and in this case the bleb is of obsidian and of the form shown. The remarkable symmetry of these buttons can be accounted for in this way. From Byaduk, Victoria.

Fig. 4. This is a hollow sphere of obsidian 2 inches in diameter—a bubble, in fact — and it is the key to the origin of the whole of these interesting objects. It is a bleb of a large bubble, but in this case another bubble with thick walls has been formed as a bleb. It is easy to understand that this bubble under other conditions would have expanded until the walls were very thin and filled with some light, highly heated gas. The rim around this bubble shows where it was attached to the large bubble of which it formed the bleb. These obsidian bubbles were formed, not during violent eruptions, or they could not have escaped destruction, but during periods of comparative quiescence, and when there was but a gentle ebullition. As they escaped from the crater they were floated away by the air currents, and landed eventually in all sorts of situations, and in some cases at great distances from their source. When found on the surface, the surfaces shown

Plate XXXIII.



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NATURAL HISTORY

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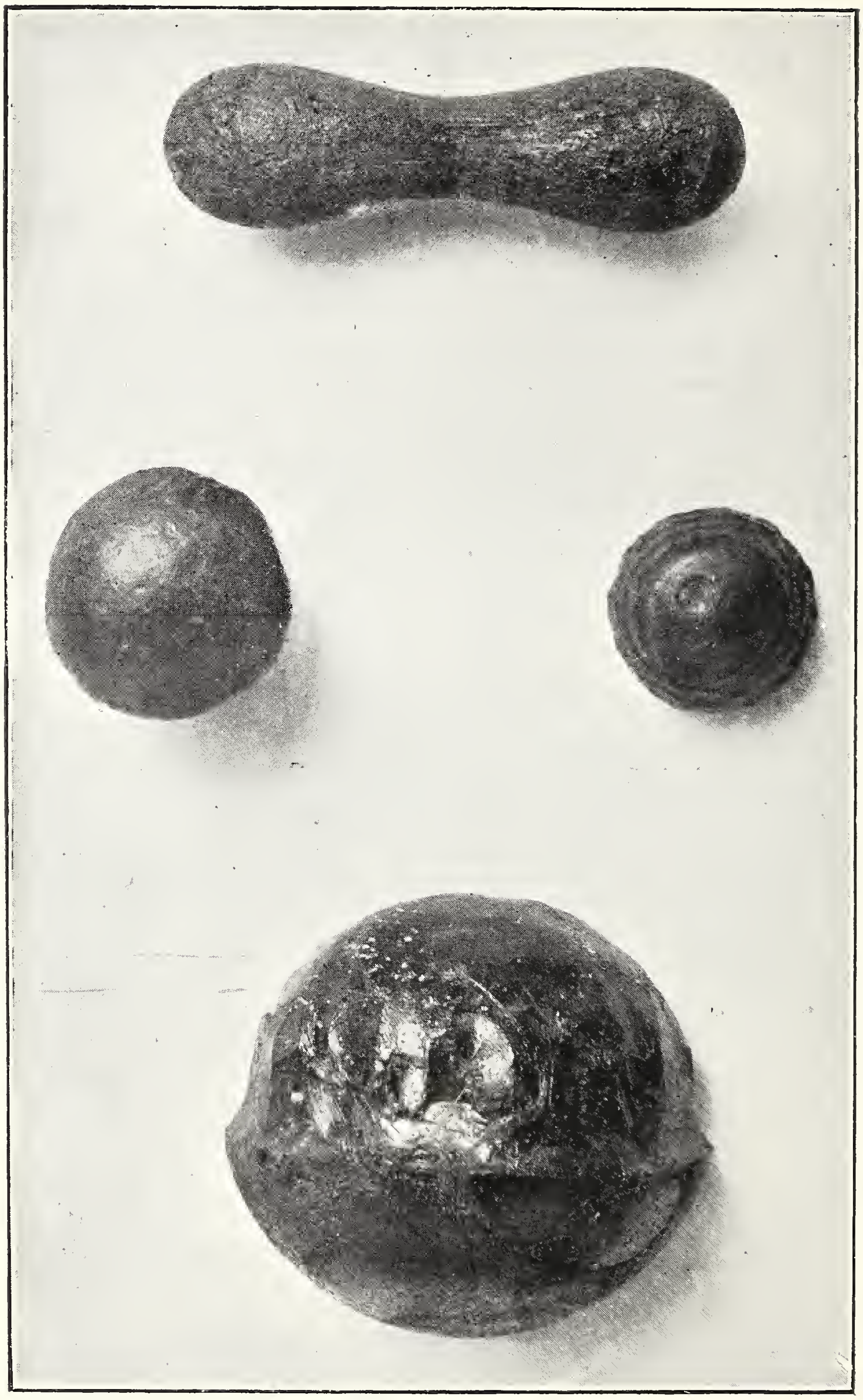
PLATE XXXIV.



in Plate I., Figs. 1, 2, 3 are uppermost. It is shown as it would stand at the bottom of the bubble, and the inner side of the sectional sphere. The inner surface is brilliantly polished.

PLATE XXXIV.

Reverse side of buttons shown in Plate.

Fig. 1.—This represents the underside of a dumb-bell form. There are curious creases and wrinkled markings or sculpturings that were caused when the viscous material was assuming its present shape—a sort of flow structure.

Fig. 2.—Shows a pitted surface, and it is larger than the obverse surface which was inside the bubble.

Fig. 3.—This under surface or surface outside the original bubble is wrinkled, and the margin evidencing its once viscous state, and there is the remains of a small bubble on the surface, the outer skin of which has been removed.

Fig. 4.—Represents the outside of the bubble, and the rim to which the large bubble was attached is well marked, as also the flaking that has taken place around this rim.

All specimens are shown natural size.

The originals of these figures are in the National Museum, and were kindly lent by the Hon. Director, Professor Baldwin Spencer, C.M.G.

REPORTS ON FOSSILS.

By Fredk. Chapman, A.L.S., F.R.M.S., National Museum.

FROM THOMSON RIVER, GIPPSLAND: COLLECTED BY MR. W. BARAGWANATH, JUN. (NOS. 100-103).

Specimens 100 and 101 are from a spur between Little Boy's Creek and Bell's Creek, Thomson River. They are the two portions of a divided block of brown indurated sandstone, showing respectively the internal mould and cast of an *Orthoceras*. This fossil has nearly parallel sides, high chambers, slightly oblique septa, and a somewhat eccentric siphuncle. There are four chambers in a length of 14mm., near the middle of the shell; their width varies from 5 to 5.5mm. in that length. The chambers become proportionately higher in the later growth of the shell. The surface-markings appear to be indicated on fragments lining the mould as fine vertical lineations. Our specimen appears to be most nearly allied to *Orthoceras arkonense*, Whiteaves,[1] from the Hamilton Group of Canada, both specimens being characterized by the distance of the septa, together with the slender form of the shell and the eccentric siphuncle. Another species which has the same type of shell is *O. vagans*, Salter[2], occurring in the Upper Ordovician (Bala Beds) of Coniston and N. Wales. From the probable existence of longitudinal striæ, our specimen, and indeed, the typical *O. vagans*, may prove to belong to the genus *Protobactrites* of Hyatt. The compressed outline in transverse section, and the straight sides, also tend to support this view.

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(1) Contrib. Canad. Palaeont., Vol. I., pt. V., No. 7, 1898, p. 406, pl. XLVIII., figs. 13, 14, 14*a*.
(2) Salter, in McCoy, Brit. Pal. Foss. 1852 (Appendix), p. VI. pl. 1 L., figs. 28, 29.

Nos. 102 and 103 came from the bluff N.W. of the junction of Little Boy's Creek and the Thomson River. They are dark blue mudstones, showing the impression of a peculiar suboval fossil, which is slightly attenuated, pointed and curved at one end, and rounded at the other. The surface is deeply concentrically grooved, and the central area is occupied by a wrinkled and sub-elevated boss. This specimen apparently represents the remains of a depressed conical shell which has been flattened in the plane of bedding. It may possibly be allied to the tent-like shell *Hercynella,* a genus not yet having described Australian species, but which I have recorded from the Yeringian beds of Victoria.[1]

FROM QUARTER SHEET NO. 34 S.W. (WOOD'S POINT). COLLECTED BY MR. O. A. L. WHITELAW. NOS. 104-117.

From Barkly River.

104. ? Fucoid remains and mud wrinkles.
105. ? Trails of fucoids and ripple marks.
106. ? Fucoid remains.

NOTE.—These rocks are comparable with the Carboniferous series of the Broken and Delatite Rivers.

From Macallister River.

107. Ochreous and micaceous conglomerate with imperfect casts of fossils, including ? *Orthoceras.*

From Lazarini's Spur.

108, 110, 111, 113. Quartzose and felspathic conglomerate, with hollow casts of fossils—? monticuliporids, very imperfectly preserved.

109, 112. Micaceous sandstone or conglomerate, with obscure traces of fossils.

From W. Watershed, Barkly River, above Crescent Creek.

114, 115, 117. Arenaceous shales, with graphitic-like bands and patches —? organic (fucoidal).

116. A shaly and crumpled phyllite with nodular inclusions—? organic. This specimen probably came from older beds than the above.

FROM QUARTER SHEET 22, N.W. (BAW BAW), COLLECTED BY MR. W. BARAGWANATH, JUN. NOS. 118-128.

118. Ferruginous gritty mudstone, with obscure traces of fossils (casts).

119. (4 specimens.) Irregularly bedded felspathic sandstone of a bluish colour, with ochreous cavities, due to the impressions of fossils (brachiopods and ? polyzoa, indet.).

From Waterloo Gully, 2 miles S. of Mt. Lookout.

120. A dark-brown ferruginous sandstone, with remains of brachiopods and crinoids (indet).

From Donnelly's Creek.

121. Ferruginous fossiliferous conglomerate, with obscure remains of corals and ? polyzoa (indet.).

122. Graphitic shale, with plant remains (indet.)

123. Shaly fossiliferous sandstone, with indeterminate remains of brachiopods and crinoids.

124. Fossiliferous sandstone, with inclusions of indurated shaly fragments. The fossils are obscure, and chiefly consist of small ramose corals or polyzoa.

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(1) Proc. Roy. Soc. Vict., Vol. XVIII., pt. II., N. S., 1906, p. 98.

125. (2 specimens.) Shale, with ? plant remains.

126. Ochreous shaly mudstone, having surface covered with interlacing and branching filaments, averaging about 1 mm. in diameter, which may be referable to worm-tunnellings or tracks of other burrowing organisms.

127. Slab of dark shale with surface covered by irregularly-branched cylindrical bodies, measuring about 5 mm. in diameter. They are probably analagous to the fossils found on the surface of the Middle Devonian shales of Ilfracombe in the S. W. of England, which have been provisionally referred by some authors to sponges. A section of an Ilfracombe specimen in my own collection, made many years ago from a specimen which I obtained from Sampson's Cave, shows a more or less distinct polygonal meshwork, without, however, any evidence of separate spicules, the interstices being filled with fine, angular quartz and felspathic mud. A microscopic slide made from the Baw Baw specimen also shows a similar mesh-structure, but more or less broken down by the surrounding matrix.

128. A white quartzose rock with a partially preserved woody stem, showing the base of a branch with exogenous structure (silicified). This specimen is probably of Tertiary age.

FROM DONNELLY'S CK., ABERFELDY R. COLLECTED BY W. BARAGWANATH, JUN. NOS. 196, 197.

196. A slab of finely-laminated talcositic shale, with branching and radial clusters of dark markings weathered in relief, probably due to marine burrowing organisms.

197. A similar rock with a large patch of filamentous and laminar graphitic markings. ? Fucoidal.

FROM PARISH OF MOLIAGUL, 2.42 CHAINS S. FROM S.E. CORNER OF ALLOTMENT A15. COLLECTED BY MR. W. H. FERGUSON. NOS. 198-202.

The rock containing the fossils is a purple indurated mudstone. The fossils are represented by the remains and impressions of a crustacean, probably referable to the genus *Hymenocaris*, and a new species. There is little doubt that they are of Lower Ordovician age.

The specimens are retained, pending the collection of additional material for subsequent description.

FROM WAANYARRA. COLLECTED BY W. H. FERGUSON. NO. 203.

A branching organism, probably referable to a hydrozoan, like *Callograptus*.

Other fragmentary fossil remains occur on the same slab, but are indeterminable.

FROM SPECIMEN HILL, WEDDERBURN. COLLECTED BY O. A. L. WHITELAW. NO. 246, CORRECTED NO. (204, OLD NO.).

A mudstone showing bedding and cleavage; with wrinkled foliaceous markings on cleaved surface (? inorganic), and small seed-like bodies scattered throughout the mass of the rock, disposed in lines parallel with the cleavage, representing crystals of iron pyrites now decomposed to limonite.

FROM ALLOT. 22, WANDIN YALLOCK, NEAR SEVILLE. COLLECTED BY A. E. KITSON, F.G.S.

[NOS. 214-231 and 247-255 (corr. NOS.)].

No. of Specimen.	Fossil Determination.
214	*Beyrichia Kloedeni*, McCoy, and fragments of trilobites.
215	A branching polyzoan or fistuliporid, indet. (casts of tubes in limonite).
216, 222, 253, 255	Fragments of trilobites, indet.
217	*Lindstrœmia* sp. Also a fistuliporid and an impression of a brachiopod.
218	Mould of part of a crinoid column.
219	Cast of *Heliolites* sp.
220	Cephalon of *Calymene* sp.
221, 223	? *Lindstrœmia*.
224, 231, 251, 254	Crinoid remains.
225, 227 229	*Athyris* sp.
226	Cephalon of *Phacops serratus*, Foerste.
228, 247, 249, 252	Casts of rugose corals, indet.
230	*Phacops serratus*, Foerste (pygidium).
231	? *Phacops* (pygidium).
248	Glabella of *Cyphaspis*, cf. *bowningensis*, Mitchell.
250	Cast of portion of a crinoid column, showing impression of articular surface, and cast of axial canal.

ADDITIONAL SPECIMENS. FOUND AT THE SAME LOCALITY BY THE WRITER OF THIS REPORT.

? *Lichas* sp. (fragment of carapace).
Cheirurus, cf. *gibbus*, Beyrich.

LITHOLOGICAL NOTES ON THE IMPURE LIMESTONE OF WANDIN YALLOCK, NEAR SEVILLE.

In hand specimens dark blue, often studded with small cubes of pyrites. The fractured surface reveals occasional fossils, as corals, brachiopods, and trilobites, which are well preserved in the hard rock. In the decomposing crust of the limestone the fossils are weathered away, leaving only their casts in limonite.

In thin slices, a microscopic examination shows the rock to be fine-grained, with numerous calcitic fragments, a fair quantity of sharp quartz grains, and much black ? bituminous and other opaque material. Occasional ossicles of crinoids occur, still showing the cleavage of calcite plates. Besides the calcareous particles, which form a large proportion of this rock, the cement which binds it is also calcitic. A section of an ostracod was seen in one of the slices, resembling *Macrocypris*, and recalling *M. vinci*, Jones, in outline, but only one-half the length of that species. Other cross-sections of a more globose form of the same group of bivalved crustaceans were seen, as well as several fragments of brachiopod shells.

The lines of sedimentation are distinctly seen in those thin sections which were cut in the right direction, and the organic remains are segregated along those lines.

The age of these beds is Silurian (Yeringian).

FROM BALD HILL QUARRY, DROMANA. NOS. 256-265. COLLECTED BY MR. A. E. KITSON.

Rhinopterocaris maccoyi, Eth. fil. sp. 256-258, 260-263.

Graptolite fragments, 259.

Specimens 264 and 265 show an irregular cross-hatched structure, probably due to shrinkage.

FROM PARISH OF KANGERONG, DROMANA. NOS. 266-271. COLLECTED BY MR. A. E. KITSON.

? Annelid borings, 267, 270.
Rhinopterocaris maccoyi, 268, 271.
Tubular limonitic impressions, indet., 269.
Obscure impressions, indet., 266.

FROM FLANNERY'S ALLOT., MANSFIELD. NOS. 765-771. FROM THE HON. D. MELVILLE, M.L.C.

Dictyonema sp. 765-767, 770.
Rhinopterocaris maccoyi, 768, 769.
Phyllocarid remains, indet., 766.
Age, probably Lower Ordovician.

FROM MORRISON'S DIGGINGS, DOLLY'S CREEK, NEAR MEREDITH. NOS. 1479, 1480. COLLECTED BY MR. A. M. HOWITT.

Ceratiocaris sp.; after the type of *C. solenoides*, McCoy, but new. (*Phyllograptus* on same slabs). Retained for description.

Lower Ordovician.

FROM ROAN HORSE GULLY, WELLINGTON RIVER (NO. 2402).

A grey subcrystalline limestone, seamed with veins of white calcite.

The rock is chiefly of organic origin, being crowded with fragments of encrinite stems and ossicles. Scattered sparsely throughout the rock are dark-grey pellets of a finely granular appearance, averaging about 5 to 6 mm. in length. These pellets may be due to calcareous organism of an algoid nature, and allied to *Girvanella*.

They are similar to the pellets occurring in the Yeringian limestones from the Dolodrook Valley, Mt. Wellington, found by Mr. E. O. Theile, upon which rock I published a short note in the *Victorian Naturalist*, June, 1907, p. 34.

FROM CLONBINANE (NO. 2397).

This contains:—

? *Lindstroemia*.
Favosites sp.
Pleurodictyum megastomum, Dun.
? *Camarotœchia*.
Atrypa sp.
? *Stropheodonta*, or *Strophonella*.

Age of beds—Silurian (Yeringian series).

REPORT ON JURASSIC PLANTS.

By Frederick Chapman, A.L.S., &c., Palæontologist to the National Museum.

(With three plates.)

Introductory Remarks.

Specimens numbered from 129 to 195, collected by Mr. A. E. Kitson, F.G.S., are remains of Jurassic plants, which appear to be from a slightly different horizon, or at all events, from an area exhibiting a different facies from that which yielded the specimens recently dealt with by Mr. A. C. Seward, of Cambridge.[1] The plant-remains are contained in an ochreous shaly mudstone, and in many cases are remarkably well preserved. The present series is of a highly interesting nature, and should considerably advance our knowledge of the distribution of the Jurassic flora of Victoria.

It may at this point be noted that *Tæniopteris spatulata* and its varieties appear to range through the whole series of beds in Victoria now regarded as Jurassic. Other types of plant-remains, however, will probably occur at definite horizons, and when sufficient data have been accumulated it should be possible to divide the Mesozoic coal-bearing series systematically, and thus to correlate the various Jurassic beds in different parts of the State.

One of the most important and abundant species in the present collection is *Thinnfeldia odontopteroides*, Morris sp., here found in company with *T. Maccoyi*, a species lately described by Mr. Seward. *Coniopteris hymenophylloides*, var. *australica*, Seward, on the other hand, is very rare in this series, as are also *Sphenopteris ampla*, McCoy, and *Cladophlebis denticulata*, var. *australis*, Morris.

The remains of *Palissya australis*, McCoy, are characteristic, and seem to be distinctly separable from forms which may be regarded as tropical examples of *Taxites*. A genus and (?) species of new occurrence in Victoria, Australia, is *Cheirolepis* cf. *setosus*, Phillips, sp.; a recognised member of the Yorkshire Jurassic flora. The slender habit and upturned branches of this form are characters which offer a marked contrast to the appearance of branches of the *Brachyphyllum* type. Some of the Gippsland specimens also bear a resemblance to plant-remains which have been described from the Trias, Rhætic and Jurassic beds of Europe under the name of *Widdringtonites*, but the material is not sufficient for determination.

Determinations.

129. *Tæniopteris spatulata*, McClelland.

130. *Thinnfeldia odontopteroides*, Morris sp. (having openly spaced and falcate pinnules.)

131. cf. *Palissya australis*, McCoy (probably comparable with Seward's *Taxites*). *Tæniopteris spatulata*, McClelland, and var. *Carruthersi*, T. Woods.

132. *Tæniopteris spatulata*, McClell.

133. *Thinnfeldia odontopteroides*, Morris sp. (with open pinnules, falcate); (?) *Brachyphyllum Gippslandicum*, McCoy.

134. *Thinnfeldia odontopteroides*, Morr. sp. (small fragment).

135. *Cladophlebis denticulata*, Brogn. sp., var. *australis*, Morris; (?) *Taxites*.

136. *Thinnfeldia odontopteroides*. Morris sp.; *T. Maccoyi*, Seward; *Tæniopteris spatulata*, McClell.

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(1) Records Geol. Surv. Vict., Vol. I., Pt. 3, 1904, pp. 155-210.

137. (?) *Thinnfeldia odontopteroides*, Morris sp., and a coniferous leaf.

138. (?) *Palissya australis*, McCoy (cone with leaf at base)—see Pl. XXXV., Fig. 4. Also leaves of *P. australis*, and fragments of *Cheirolepis* cf. *setosus*, Phill. sp.

139 (?) *Thinnfeldia Maccoyi*, Seward (fragment).

140. *Sphenopteris ampla*, McCoy; *Thinnfeldia Maccoyi*, Seward.

141. *Tæniopteris spatulata*, McClell.

142. Fragment of a leaf, indet.

143. *Tæniopteris spatulata*, McClell.

144. *Thinnfeldia* sp. (fragment).

145. *Thinnfeldia odontopteroides*, Morris sp.; *Cheirolepis* cf. *setosus*, Phill, sp.

146. *Tæniopteris* (?) *spatulata*, var. *Carruthersi*, T. Woods.—A short and very broad leaf measuring 3 cm. in width[1]; the secondary veins are very close together.

147. *Thinnfeldia Maccoyi*, Seward; *Tæniopteris spatulata*, McClell.

148. *Thinnfeldia* (?) *Maccoyi*, Seward.

149. *Tæniopteris spatulata*, McClell., and var. *Carruthersi*, T. Woods.

150. *Palissya australis*, McCoy; *Cladophlebis denticulata*, Brongn., sp. var. *australis*, Morris; and *Tæniopteris spatulata*, McClell.

151. *Tæniopteris spatulata*, McClell., var. *Daintreei*, McCoy.

152. *Tæniopteris spatulata*, McClell.

153. *Thinnfeldia Maccoyi*, Seward, and *Tæniopteris spatulata*, McClell.

154. *Thinnfeldia Maccoyi*, Seward; *Tæniopteris spatulata*, McClell., and var. *Daintreei*, McCoy.

155. *Taxites* sp.

156. *Thinnfeldia* sp.; *Tæniopteris spatulata*, McClell., var. *Daintreei*, McCoy; and a carbonized woody stem, (?) coniferous.

157. Fragment of leaf, (?) coniferous.

158. *Tæniopteris spatulata*, McClell., var. *Daintreei*. McCoy.

159. *Cladophlebis denticulata*, Brongn. sp., var. *australis*, Morris; *Tæniopteris spatulata*, McClell.

160. *Tæniopteris spatulata*, McClell., var. *Daintreei*, McCoy; *Araucarites* sp., cone-scale and attached leaflet (Pl. XXXV., Fig. 6); *Cheirolepis* cf. *setosus*, Phillips sp.

161. *Tæniopteris spatulata*, McClell.

162. *Thinnfeldia odontopteroides*, Morris sp. (Pl. XXXV., Fig. 1).

163. *Tæniopteris spatulata*, McClell., and *Palissya australis*, McCoy.

164. *Thinnfeldia Maccoyi*, Seward; *Tæniopteris spatulata*, McClell.

165. *Tæniopteris spatulata*, McClell.; *Palissya australis*, McCoy.—foliage and (?) cone (Pl. XXXV., Fig. 2).

166. (?) *Thinnfeldia* sp.

167. Leaflet, (?) coniferous.

168. (?) *Cladophlebis denticulata*, var. *australis*, Morris; *Palissya australis*, McCoy.

169. *Thinnfeldia odontopteroides*, Morris sp.

170. *Thinnfeldia* sp.; *Tæniopteris spatulata*, McClell.

171. Fragments; too imperfect for identification.

172. *Tæniopteris spatulata*, McClell.

173. (?) *Coniopteris hymenophylloides*, var. *australica*, Seward; *Palissya australis*, McCoy.

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[1] This specimen apparently bears the same relation to *T. spatulata* var. *Carruthersi* as *Tæniopteris ovalis*, Lindley and Hutton sp., does towards *T. major* L. and H.

174. *Tæniopteris spatulata*, McClell., and *Brachyphyllum Gippslandicum*, McCoy (Pl. XXXV., Fig. 3).

175. *Tæniopteris spatulata*, McClell., and var. *Carruthersi*, T. Woods; (?) *Palissya australis*, McCoy.

176. *Tæniopteris spatulata*, McClell.; *Palissya australis*, McCoy.

177. *Thinnfeldia* sp.

178. *Thinnfeldia* sp.; *Tæniopteris spatulata*, McClell., and var. *Carruthersi*, T. Woods.

179, 180. *Tæniopteris spatulata*, McClell., and var. *Carruthersi*, T. Woods.

181. *Thinnfeldia odontopteroides*, Morris sp.; *Tæniopteris spatulata*, McClell., and (?) var. *Daintreei*, McCoy.

182. *Palissya* sp.

183. *Thinnfeldia odontopteroides*, Morris sp.

184. *Thinnfeldia* sp.; *Tæniopteris spatulata*, McClell.

185. *Palissya* sp.; *Thinnfeldia* sp.

186. *Coniopteris hymenophylloides*, Brongn. sp., var. *australica*, Seward; (?) *Thinnfeldia* sp.; *Tæniopteris spatulata*, McClell.; *Palissya australis*, McCoy (Pl. XXXV., Fig. 5).

187. *Thinnfeldia* (?) *indica*, Feismantel; *Tæniopteris spatulata*, McClell., and var. *Carruthersi*, T. Woods.

188. *Tæniopteris spatulata*, McClell.; *Cheirolepis* cf. *setosus*, Phill. sp. (Pl. XXXV., Fig. 7).

189. *Thinnfeldia odontopteroides*, Morris sp.

190. *Tæniopteris spatulata*, McClell.; *Palissya australis*, McCoy.

191. *Tæniopteris spatulata*, McClell.

192. *Tæniopteris spatulata*, McClell.; *Cheirolepis* cf. *setosus*, Phill. sp. (Pl. XXXV., Fig. 8).

193. (?) *Thinnfeldia*; *Tæniopteris spatulata*, McClell.

194. *Tæniopteris spatulata*, McClell.

195. *Cheirolepis* cf. *setosus*, Phill. sp.

NOTES ON SPECIMENS INCLUDED IN THIS SERIES.

Thinnfeldia odontopteroides, Morris sp.

This species is abundant in the present collection. It has been recorded only once previously from Victorian Jurassic strata, but is a characteristic fossil of the Tasmanian beds. The earlier reference to this species as a Victorian fossil was made by Messrs. Hall and Prithard,[1] who recorded it from olive shales outcropping along the beach-floor south of Grice's Creek. From the same locality *Tæniopteris spatulata* var. *Daintreei*, McCoy (as *T. Daintree*[2] and *Angiopteridium spathulatum*[3]) has already been noted, and I now record two additional species obtained two years ago at the same place, when in company with Mr. G. Sweet, F.G.S., viz., *Coniopteris hymenophylloides*, Brongn. var. *australica*, Seward, and *Cladophlebis denticulata*, Brongn. var. *australis*, Morris.

The apical part of a frond of *T. odontopteroides* is shown in Fig. 1 (Pl. XXXV.), with the distinctive venation of one of the pinnules. In the falcate outline the pinnules resemble the Upper Mesozoic variety of the species rather than the type with rounded lobes found in the Older Mesozoic (Triassic) series.

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(1) Proc. Roy. Soc. Vict., 1901, Vol. XIV., Pt. 1, N.S., p. 39.

(2) Monthly Prog. Rept. Geol Surv. Vict., 1900. N.S., No. 12, p. 6.

(3) Hall and Pritchard, *loc. supra cit.*

Tæniopteris spatulata and its varieties.

Since some confusion seems to exist regarding the nomenclature and relationship of the Australian, and in particular the Victorian, members of the genus *Tæniopteris*, the following notes are placed on record as an attempt to define the variable representatives of a broadly characterized species, of which the infertile leaves are the only materials for diagnosis. During the course of examining a very large number of *Tæniopteris* leaves, both in the National Museum collection, and in that of the Geological Survey of Victoria, I have been strongly convinced that all the forms represented, at least in our Victorian Jurassic strata, are closely related to one another, and that in all probability there is only one central type, viz., *T. spatulata*, McClelland; with an extreme variation in opposite directions, as exemplified by the broad type of leaf—*T. Carruthersi*, T. Woods, and the narrow type—*T. Daintreei*, McCoy. This conclusion has been arrived at by taking into consideration all the available characters of the *Tæniopteris* leaf, such as the leaf-width, size and character of the midrib, relation of the secondary veins to the midrib, and the character and spacing of the secondary veins.

T. spatulata, McClelland[1].

This species, as the central type, may be defined practically in the terms employed by McClelland. It has a moderately broad leaf, slightly narrowing towards the base, having a roundly pointed to spatulate apex, and somewhat flexuose surface; the sides generally very gently convex. The midrib thickens towards the base; the secondary veins are variably spaced and emerge at a slightly acute angle from the midrib, almost immediately bifurcating,[2] afterwards, in the majority of specimens, turning at right angles. The type form, *T. spatulata*, as such, had not previously been recorded from Victoria, but we also have it from the following localities, in the collection of the Melbourne National Museum:—Burne's Creek, Traralgon, Calignee, and Wild Dog Creek in Gippsland, Barrabool Hills, near Geelong, and Coleraine, Western Victoria.

T. spatulata, McClelland, var. *Carruthersi*, T. Woods.[3]

A critical inspection of the spacing of the secondary veins in our Victorian examples shows every gradation to exist between Carruthers' figured specimen and that regarded as a new variety of *T. Daintreei* (major) by Mr. Seward.[4] The specimen figured by Mr. J. Stirling in his report,[5] No. 7, page 4, as *T. Carruthersi*, is a well-preserved example, and I have compared it with a typical leaf of *T. Carruthersi* from the Ipswich coal-fields, presented to the National Museum by Mr. J. Shirley, B.Sc.; with the result that both are seen to show the same broad character of leaf, and the secondary veins are spaced exactly alike, whilst the forking takes place usually near to the midrib as in the variety *Daintreei*, but also at every point between that and the margin. We are indebted to Mr. G. B. Pritchard, F.G.S., for the loan of a series of Queensland *Tæniopteris* leaves, which has greatly aided in the comparison of the Victorian examples of the genus.

The variety *major* described by Seward, of which the type is now in the National Museum, is variable in the form of the leaf. The chief distinctive character, as Seward also remarks, is the relatively greater

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(1) Rep. Geol. Surv. India, 1850 p. 53, pl. xvi., fig. 1.

(2) The forking of the lateral veins is shown near the edge of the lamina in McClelland's figure, which, although taken as the type, is not "typical" in every respect, when compared with the numerous figures of the same form by Oldham and Morris (Flora of Gondwana System, Pal. Ser. II Vol. I., pt. 1. 1863, p. 34, pl. vi., figs. 1–7), in which the forking takes place as frequently, or even more so, near the midrib.

(3) "T. Dantreei" Carruthers, in Daintree, Quart. Journ. Geol. Soc., Vol. XXVIII. 1872, p. 350, pl XXVII., fig. 6, *T. Carruthersi*, T. Woods, Proc. Linn. Soc. N. S. Wales, Vol. VIII., pt. 1, 1883, p. 37.

(4) Records Geol. Surv. Vict., Vol. I., pt. 3, 1904, p. 171, figs. 23, 24.

(5) Report Vict. Coalfields, No. 7, 1900.

breadth of the leaf, as compared with *T. spatulata*. In the type of *T. spatulata*, var. *Carruthersi* the original figure shows the secondary veins more widely spaced than in the majority of the Victorian examples, but several of the latter are identical both in vein-spacing and in the breadth and shape of the leaf.

It is also highly probable that the Victorian *T. spatulata*, var. *Carruthersi* is identical with the examples of *Tæniopteris* figured by Feistmantel[1] from the Stormberg series of South Africa, as well as the Tasmanian specimens of "*T. Carruthersi*" also illustrated by the same author.[2] The tendency has hitherto been to regard the Ipswich plant-remains as distinct from the Victorian, and to be more comparable in age with the Stormberg flora, which has a Rhætic facies. There is reason to believe, however, that some horizons of the Victorian coal-bearing Mesozoic beds are relatively as old, since, amongst other data, I am able to record the occurrence of *Stenopteris elongata*, Carruthers sp., in Victorian strata; a plant which is also a member of the Stormberg and Ipswich floras.

The variety *Carruthersi* is distinguished from the type-form T. *spatulata* by a shorter and broader leaf, and a tendency to a wider spacing of the secondary veins, the latter having at first an acute emergence from the midrib, then nearly horizontal, and afterwards turning flexuosely upward to the margin. The dichotomy of the veins is nearer to *T. spatulata*, var. *Daintreei* than to the type-form; that is to say, generally close to the midrib. In his description of the figured specimen of this variety from San Remo, Mr. Stirling refers to it[3] as having secondary veins ("lineated venules") frequently dichotomous; an inspection of the figured specimen shows, however, that the secondary veins dichotomize, as a rule, close to the point of emergence from the midrib and then run continuously parallel, excepting rarely at one or two points, and fork near the margin of the leaf. Other localities in Victoria for this variety are Jeetho Valley (Stirling), Jumbunna and Kongwak (Seward—recorded as *T. Daintreei*, var. *major*), together with the present locality of Whitelaw. In Queensland, Daintree obtained this variety from the Tivoli Coal Mine, Ipswich, and W. Souttar from Redbank, near Mount Esk, Brisbane River, North of Laidley.[4] Mr. Pritchard has typical specimens from Park Cutting, near Brisbane.

T. spatulata, McClelland, var. *Daintreei*, McCoy.[5]

This variety is represented by the extreme form, in which the leaf is long, narrow, and parallel-sided, with a fairly thick midrib, and secondary veins disposed at right angles to it, dichotomizing close to the point of emergence.

The localities for typical specimens of this variety are very numerous in Victoria, and include the Barrabool Hills, near Geelong, Murndal on the Wannon River, and Cape Patterson (McCoy); the fore-shore between Grice's Creek and Mornington (Hall, Pritchard, and Kitson); Burnes Creek, Callignee, Wild Dog Creek, Jeetho, Griffith's Point, Mirboo South, Whitelaw, and South Warragul in Gippsland (Stirling); Kongwak and Jumbunna in Gippsland, and Irvine's Creek, Cape Otway District (Seward). The variety *daintreei* occurs very sparingly at the present locality, Whitelaw R.S.

Notes on the venation of *Tæniopteris* leaves.

The following are the results of an examination of the venation of the leaves of *Tæniopteris*, and will show that as regards the vein-spacing, very little value can be attached to this as a distinguishing feature.

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(1) Abhandl. Kön. böhm. Gesellsch. Wiss. Prague, Ser. VII Vol. III. No. 6, 1889. p. 65. pl. II. figs. 6-10.

(2) Spisuv poctenych Jubilejni cenou: Kön. böhm. Gesell. Wiss. Prague, Vol. III. 1890, pl. VIII. fig. 14.

(3) loc. cit., p. 4.

(4) Geol. and pal. Queensland, Jack and Etheridge, 1892, p. 374.

(5) Trans. Roy. Soc., Vict., 1860, Vol. V. p. 97. Prod. Pal. Vict., 1875, Dec. II. p. 15, pl, XIV. figs. 1, 2.

Carruthers' Queensland specimen of *T.* "*Daintreei*" (*T. spatulata*, var. *Carruthersi*) has 6-8 secondary veins in 5 mm. at the lateral margin. McClelland's figure of *T. spatulata* has about eight secondary veins in 5 mm. Stirling's "*T. Carruthersi*" (identified by McCoy) has nine secondary veins in 5 mm. Seward's types of the variety *major* (measured on the actual figured specimens in the National Museum), have from 12-14 secondary veins in 5 mm. The variety *Daintreei* figured by McCoy as the type of *T. Daintreei*, in the National Museum[1] shows 10-14 secondary veins in 5 mm.

Mr. Seward's opinion that *T. Carruthersi* is probably distinct from the forms above-mentioned seems to be partially supported by the fact that the broad leaves from Gippsland have closer secondary veins than the majority of the Queensland specimens, as also have the Stormberg examples, which show from 5-7. The Tasmanian examples show from 6-7 secondary veins in 5 mm., as figured by Feistmantel. Occasional leaves are met with in Victoria, however, as described previously, which match the Queensland examples in this particular feature, and are linked to the extreme forms by the slightest gradations.

The above view that *T. spatulata* is the type form, is supported in the main by the conclusions of Messrs. W. S. Dun[2] and A. C. Seward[3], although the former author then discarded *T. Daintreei* even as a varietal form; whilst Seward, although accepting *T. spatulata* as the species having priority over *T. Daintreei*, places *T. spatulata* in the synonymy of the former, retaining it as the species, evidently with a view to avoid disturbance of nomenclature. Arber, in his lately published catalogue of the Glossopteris Flora,[4] accepts *T. spatulata*, McClelland, as the type of the Indian, South African, and Australian *Tæniopteris* of the forms herein dealt with, although in the synonymy he queries the originally described type. McClelland's figures and description appear, however, sufficiently clear to justify the acceptance of this species, especially since is has been subsequently referred to and illustrated from other Indian specimens by Oldham and Morris[5], who, by the way, include varieties which, according to the figures, agree with *Carruthersi* and *Daintreei*.

Brachyphyllum Gippslandicum, McCoy.

Brachyphyllum Gippslandicum, McCoy, 1900. In Stirling's Report No. 7, on Victorian Coalfields, Pl. II., Figs. 1, 1*a-c*, 2, 5, 5*a*, and Pl. III., Figs. 10-16.

The form of the leaves in this species is roundly ovate as distinguished from *B.* (?) *australe*, Feistmantel[6], in which the leaves are rhomboid-oblong. They closely resemble the leaves of the Wealden species *B. spinosum*, Seward[7]. It is, however, to *B. mamillare*, Brongn.,[8] that the present species bears most resemblance, though it does not branch so frequently.

Several fragments, which may be referred to the above species, occur in the present collection. Figure 3, Pl. XXXV., represents a portion of a stem showing the scale-like leaves. The genus does not appear to be common in the Victorian Jurassic series, so far as known. The previously recorded localities are Albert River, Burne's Creek, and Jeetho River, all

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(1) The location of McCoy's type in the National Museum, Melbourne, is queried by Arber, Cat. Gloss Flora (Brit. Mus.), 1905, p 125. The specimen, however, is in the collection, and is so labelled.

(2) Rep. Austr. Assoc. Adv. Sci, Sydney. 1898, p. 392 In the course of a recent conversation Mr Dun expressed his concurrence in the views here brought forward, as to the advisability of keeping *T. Daintreei* as a varietal form of *T. spatulata*.

(3) Records Geol. Surv, Vict., Vol. I., pt. 3, 1904, p. 169.

(4) Op. supra cit. p. 124.

(5) Mem. Geol. Surv. India, Ser. II., Vol. I., pt. 2, 1863, p. 34, pl. VI., figs. 1-7 (as *Stangerites spatulata*, McClelland sp.).

(6) Palæontographica, Suppl. III., 1878, pp. 97, 98, pl. VII., figs 3-6, pl. XVII.

(7) Cat. Mesozoic Plants in the Brit. Mus.. pt. II. Wealden Flora, 1895, p. 215, pl. XVII., figs. 1-6.

(8) Prodrome, 1828, p. 109. Feistmantel, Palæontologia Indica, ser. xi. vol. II. pt. II. p. 96 (16), pl. x. fig. 12; pl. XI. figs. 2, 3; pl. XII; pl. XIII.

in Gippsland. There is also a doubtful example, represented by a somewhat denuded stem, from the Jurassic of Bellarine, near Geelong, in the National Museum collection.

Palissya australis, McCoy.

Palissya australis, McCoy, 1900, in Stirling's Report No. 7, on Victorian Coalfields, Pl. III., Figs. 8, 9.

The Victorian Mesozoic species figured under the above name by McCoy in Stirling's Report, is closely comparable with *Palissya Brauni*, Endlicher[1], as well as with some of the specimens figured by Feistmantel from the Indian (Rajmahal) Flora, especially *P. conferta*, Oldham and Morris sp.[2] The decurrent habit of the leaves in *P. australis*, in common with other described species of this genus helps to distinguish the Victorian form from branches of the type *Taxites*, which may best include those in which the leaves are closely set upon the stem and spirally arranged, but not decurrent.

Figs. 2 and 4 are cones which may belong to *Palissya australis*, since they are closely associated with the leaves of that species; in one instance, moreover, there is a leaf typical of *Palissya* attached to the base of the pedicle which bears the cone. These cones are of small size compared with those of *P. Brauni*, but they bear a general resemblance to those already known from the Rhætic and Oolite. Fig. 5, Pl. XXXV., is a fragmentary specimen of *Palissya australis*. The peculiar transverse partitions seen on the upper part of the stem may be due to fragments of the leaves bent backward and lying across it.

Cheirolepis cf. *setosus*, Phillips sp.

Brachyphyllum setosum, Phillips, 1875, Geol. Yorkshire, p. 229, woodcut 60. Schimper and Schenk, in Zittel's Traité de Paléontologie, 1891, p. 278.

Cheirolepis setosus, Phill. sp., Seward, 1900, Cat. Mesozoic Plants, Brit. Mus., Jurassic Flora, Pt. I., p. 294, text figure 53A and B.

Several fragments of a plant agreeing in many characters with the Jurassic species above quoted, occur in this collection. One specimen has sharp lanceolate leaves arranged close to the stem; it bears a near resemblance to Seward's figure 538 (loc. cit. supra) of a specimen from Scarborough in the Whitby Museum. Both genus and species are new to Australia.

LIST OF JURASSIC PLANTS MENTIONED IN THIS REPORT.

Filicales.

Coniopteris hymenophylloides, Brongn. sp., var. *australica*, Seward.—Nos. (?) 173, 186.

Cladophlebis denticulata, Brongn. sp., var. *australis*, Morris.—Nos. 135, 150, 159, (?)168.

Sphenopteris ampla, McCoy.—No. 140.

Thinnfeldia odontopteroides, Morris sp.—Nos. 130, 133, 134, 136, (?)137, 145, 162, 169, 181, 183, 189.

Thinnfeldia Maccoyi, Seward.—Nos. 136, (?)139, 140, 147, (?)148, (?)153, (?)154, 164.

Thinnfeldia sp. indet.—Nos. 144, 156, (?)166, 170, 177, 178, 184, 185, (?)187, (?)193.

Thinnfeldia (?) *indica*, Feistmantel.—No. 187.

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(1) See Schimper and Schenk in Zittel, Traité de Paléontologie, 1891, p 324, fig. 230

(2) See Feistmantel-Palæontologia Indica, 1877, Ser. II. Vol. I., pt. 2, p. 85 (137), pl. XLVIII. fig. 5.

Tæniopteris spatulata, McClelland.—Nos. 129, 131, 132, 136, 141, 143, 146, 147, 149, 150, 152-4, 159, 161, 163-5, 170, 172, 174-6, 178, 179, 181, 184, 186-8, 190-4.

Tæniopteris spatulata, var. *Carruthersi*, T. Woods.—Nos. 131, 146, 149, 175, 178-80, 187.

Tæniopteris spatulata, var. *Daintreei*, McCoy.—Nos. 151, 156, 158, 160, (?)181.

Coniferales.

Araucarites sp. (cone-scale and leaflet).—No. 160.

Brachyphyllum Gippslandicum, McCoy.—Nos. (?)133, 174.

Palissya australis, McCoy.—Nos. (?)131, 138, 150, 160, 163, 165, 168, 173, (?)175, (?)176, (?)182, (?)185, 186, 190.

Cheirolepis cf. *setosus*, Phillips sp.—Nos. 145, 160, 188, 192, 195.

Taxites sp.—Nos. (?)135, 155.

(?)Coniferous woody stem.—No. 156.

(?)Coniferous leaflet.—Nos. 137, 167.

The specimens, Nos. 235 and 236, were collected by Mr. W. H. Francis, Allotment 97D, Parish of Woolamai.

No. 235 is a bore-core, at 236 feet, of hard, grey sandstone, well bedded, and showing numerous carbonized plant-remains on the fractured surfaces.

Taeniopteris spatulata, var. *Daintreei*. Fragments of leaves numerous and typical.

(?) *Sphenopteris* sp.

(?) *Albertia* or (?) *Dammara*. Numerous long ovate and recurved leaves, associated with small coniferous seeds and twigs, may be doubtfully referred to one or other of the genera named. The leaves remind one of *Albertia australis*, McCoy, but differ in being proportionally broader.

No. 236, from 236 feet, shows similar plant-remains to the preceding, with the exception of (?) *Sphenopteris*, and with the addition of *Araucarites*, an elongated cone-scale similar to Seward's *Araucarites* sp. A. (Records Geol. Surv. Vict., vol. 1, pt. 3, p. 181, fig. 42.)

The specimens, Nos. 237-241, were collected by Mr. A. E. Kitson, F.G.S., Allotment 48, Hennessy's Well, Bena. They consist of friable yellow sandstones, with numerous plant-impressions and carbonized seeds.

No. 237.—*Carpolithes* sp. An ovoid seed measuring 5mm. x 3.5mm.; probably referable to the Ginkgoales.

No. 238.—*Taeniopteris spatulata*, var. *Daintreei*, McCoy; several fragments. (?) *Pagiophyllum*. A crushed and distorted cone, apparently attached to a stem bearing a portion of another cone. The cones seem to average 4cm. in length. It would be of much interest to meet with undoubted examples of this genus in the Victorian Jurassic strata, since they are found in similar beds in Yorkshire, which contain so many genera in common with Victorian strata.

No. 239.—*Taeniopteris spatulata*, McClelland, and its varieties *Carruthersi*, T. Woods, and *Daintreei*, McCoy.

No. 240.—*T. spatulata*, and vars. *Carruthersi* and *Daintreei*. Also *Carpolithes* sp.

No. 241.—*Taeniopteris spatulata* var. *Daintreei*, and (?) *Pagiophyllum*. This specimen represents the opposed face to No. 238.

Specimens 242-245 were collected by Mr. A. E. Kitson, F.G.S., from the cliff near Sandy Water Holes, Allot. 130, Parish of Woollamai, about 1¾ miles west of Kilcunda.

Dark-coloured mudstones, with indistinct plant-remains.

242.—Carbonized stems and other fragments, indeterminable.

243.—(?) *Taeniopteris spatulata*, McClell. var. *Carruthersi*, T. Woods, and other plant-remains, indet.

244.—*Taeniopteris spatulata*, var. *Daintreei*, McCoy.

245.—(?) *Carpolithes* and other plant-remains (very obscure).

EXPLANATION OF PLATES.

Plate XXXV.

Fig. 1.—*Thinnfeldia odontopteroides*, Morris sp. Apical portion of frond showing venation. [M.D. 162]. x2.

Fig. 2.—(?)*Palissya australis*, McCoy. A cone. [M.D. 165]. x4.

Fig. 3. *Brachyphyllum Gippslandicum*, McCoy; portion of a stem. [M.D. 174]. x3.

Fig. 4. (?)*Palissya australis*, McCoy; cone with leaf at base. [M.D. 138]. x4.

Fig. 5.—*Palissya australis*, McCoy; partly denuded stem with leaves at base. [M.D. 186]. x3.

Fig. 6.—*Araucarites* sp.; cone-scale and attached leaflet. [M.D. 160]. x2

Fig. 7.—*Cheirolepis* cf. *setosus*, Phillips sp. [M.D. 188]. x2.

Fig. 8.—*Cheirolepis* cf. *setosus*, Phill. sp.; (?) cone-scales. [M.D. 192]. x4.

From Jurassic; Whitelaw Railway Station, Gippsland.

Plate XXXVI.

Fig. 1.—*Tæniopteris spatulata*, McClelland. Typical leaves, showing spatulate apex. From the Jurassic of Whitelaw Railway Station. Geol. Surv. Vict. coll. [M.D. 187].

Fig. 2.—*T. spatulata*, McCl. From Park Cutting, near Brisbane. G. B. Pritchard coll.

Both figures of natural size.

Plate XXXVII.

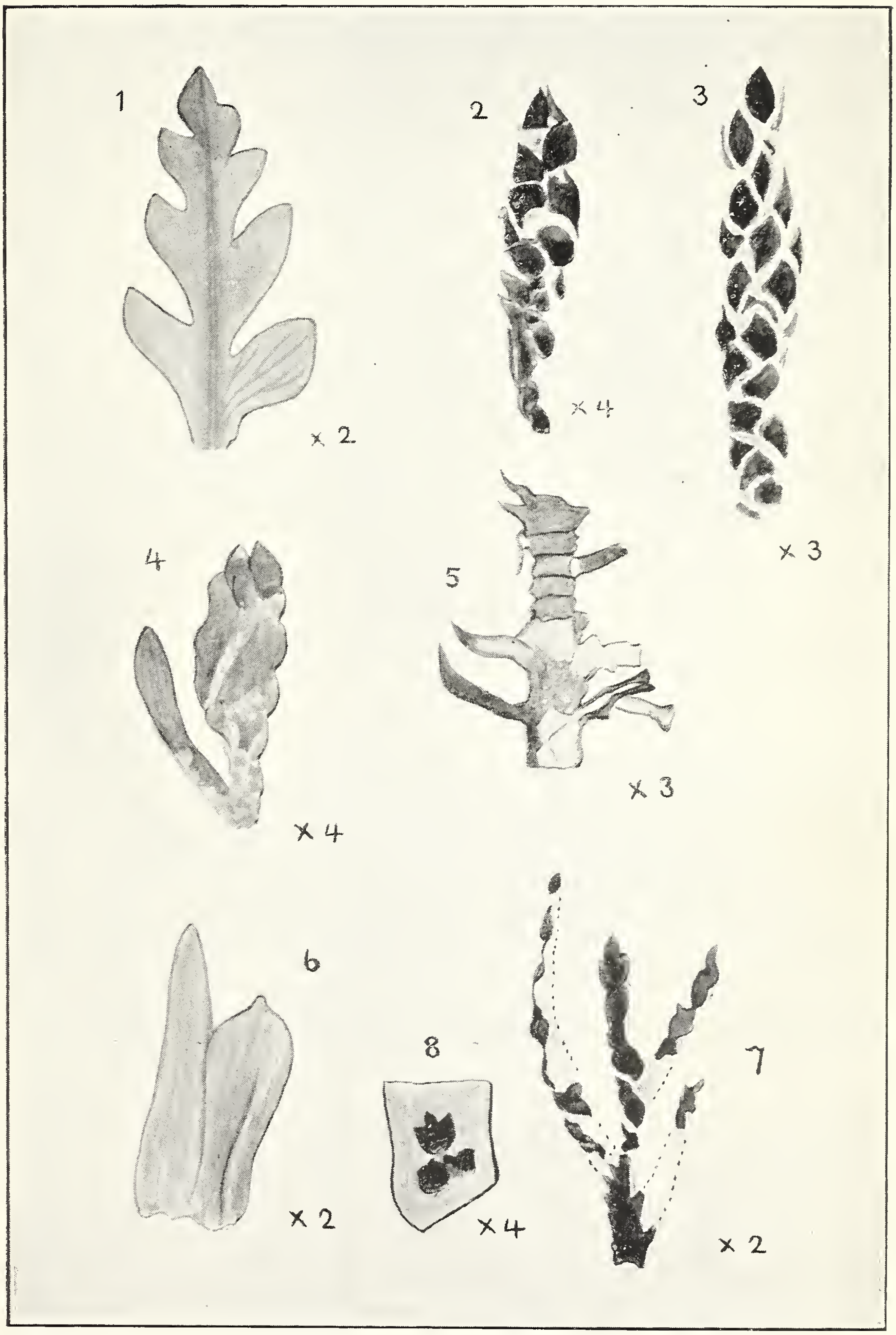
Fig. 1.—*Tæniopteris spatulata*, var. *Carruthersi*, T. Woods. Park Cutting, near Brisbane. G. B. Pritchard coll.

Fig. 2.—*T. spatulata*, var. (?) *Carruthersi*. An abnormal specimen of a broad, ovate lamina, Whitelaw Railway Station. [M.D. 146].

Fig. 3.—*T. spatulata*, var. *Daintreei*, McCoy. Splitter's Gully, off Ruby Creek, S. Gippsland. Geol. Surv. Vict. coll.

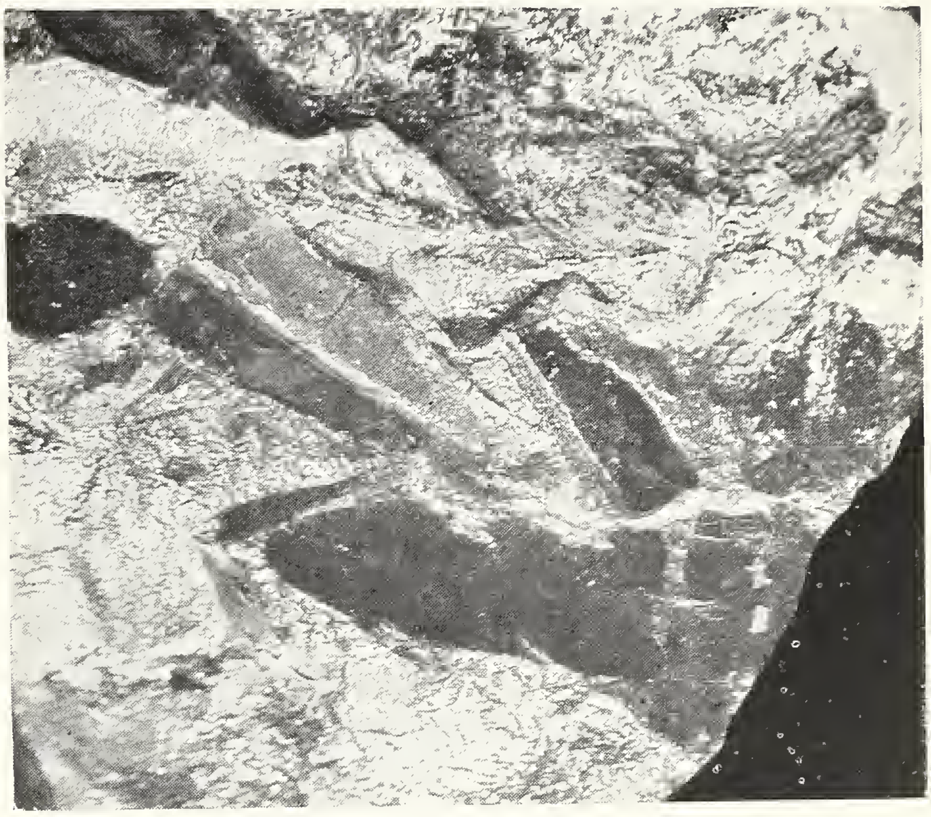
All figures of natural size.

PLATE XXXV.



BRITISH MUSEUM
NATURAL HISTORY

PLATE XXXVI.



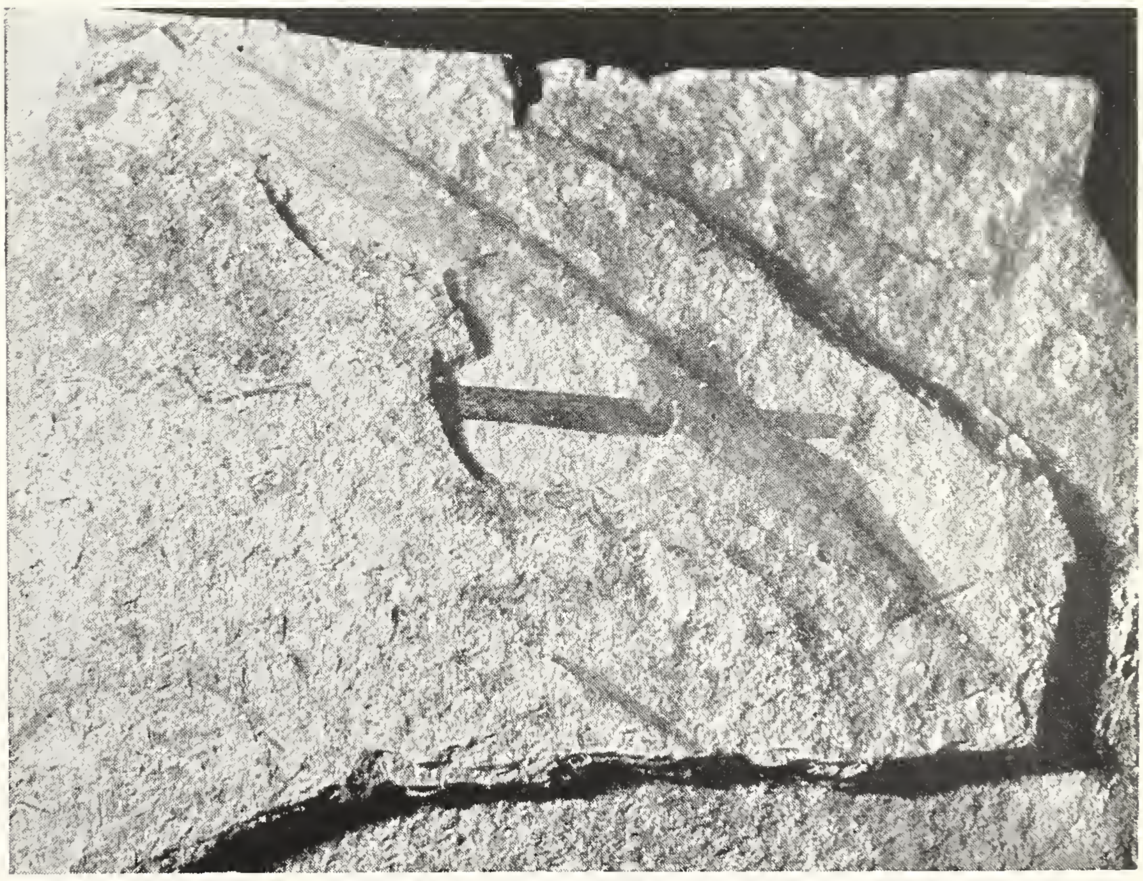


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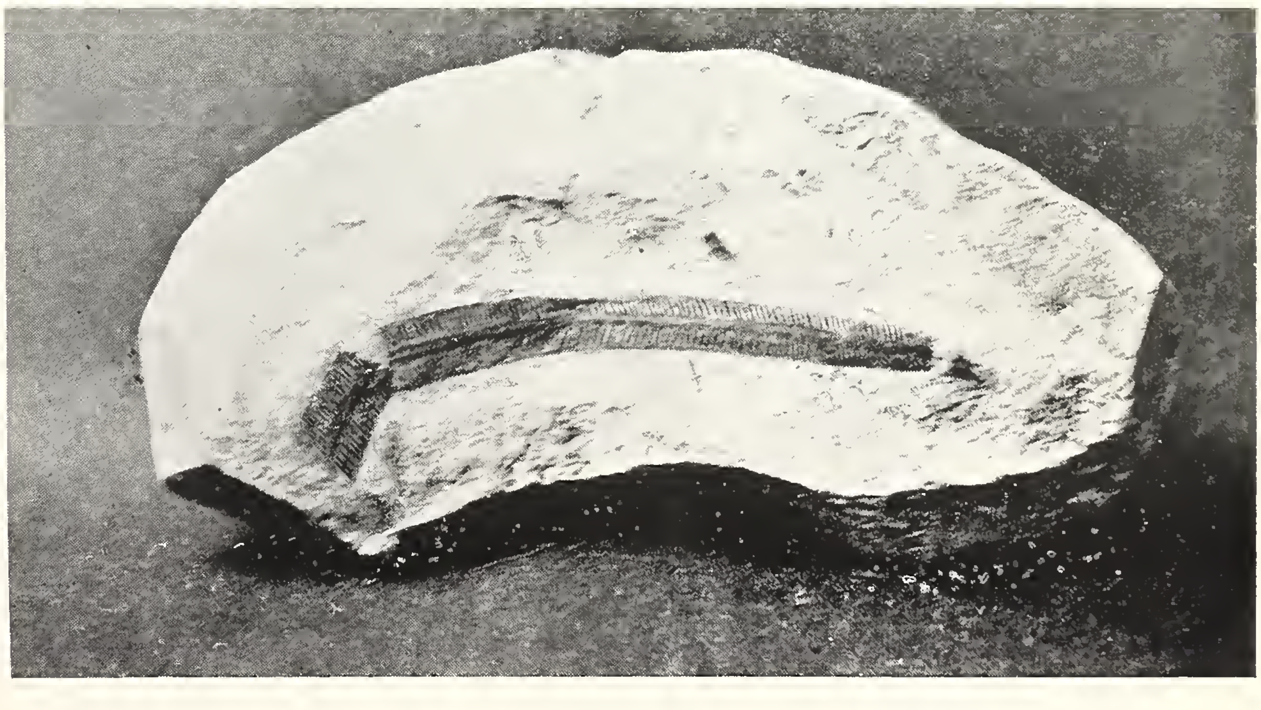
PLATE XXXVII.



BRITISH MUSEUM
NATURAL HISTORY

REPORTS ON GRAPTOLITES.

By T. S. Hall, M.A. (Melbourne University).

From 2 Miles E. of Myrtleford. Collected by Mr. E. J. Dunn. No. 1459.

The specimen is a fragment of one of the Dicellograptidæ, and is indicative of Upper Ordovician age.

From Kerrie, Riddell. Collected by Mr. A. E. Kitson. Nos. 1460, 1461.

The specimens are counterparts, and show an example of a species of *Climacograptus.* The age is either Upper Ordovician or Lower Silurian. 7.6.07.

From 8 Chains W. of S.-E. corner of Allot. 15b of h, Parish of Barp, near Dunolly. Collected by Mr. W. H. Ferguson. Nos. 1462-1484.

Specimens Nos. 1470, 1473, 1478, 1479, 1481, are apparently *Dictyonema*, with a very fine mesh, No. 1481 being almost certainly so. Nos. 1477 and 1483 seem to be *Dendrograptus.* Nos. 1462, 1472, 1480, 1482, and 1484 seem to be crustaceans allied to *Rhinopterocaris,* while No. 1466 is perhaps a Brachiopod.

The whole of the specimens are very badly preserved, so that identifications of the graptolites are not possible. The age of the rocks is uncertain, but is probably Lower Ordovician.

From the N.-E. corner of Dr. Wolfenden's Paddock, Tarnagulla-road, Parish of Painswick [No. 18 of IX.]. Collected by Mr. W. H. Ferguson. Nos. 1539-1617.

The following are present:—

Clonograptus sp. Nos. 1566, 1569, 1575, 1591, 1595 (?), 1596, 1614.
C. magnificus (?). No. 1579.
C. flexilis. Nos. 1592, 1600, 1601, 1617 (?).
Bryograptus sp. No. 1580 (?).
Tetragraptus decipiens. Nos. 1569, 1591 (?), 1606, 1608 (?), 1615, 1616 (?).
Dichograptus octobrachiatus. No. 1613 (?)—A 5-armed form.
Dictyonema spp. No. 1555, 1609 (?).
Phyllograptus typus (?), 1558.

Sponge spicules are common; the following genera seem represented:—

Stephanella. Nos. 1541 (?), 1591 (?).
Protospongia. No. 1601 (?).

Some of the others contain sponge spicules and graptolite fragments, but many are quite indeterminate. Nos. 1545-1554 inclusive are missing.

I have very little hesitation in referring the beds to the Lancefieldian series. The abundance of sponge remains is remarkable, and most of them consist of straight spicules with a radiating arrangement. Specimens Nos. 1605 and 1616, which are counterparts, are striking, but, like the whole collection, graptolites and sponges alike are extremely indistinct through weathering.

FROM DUNOLLY, NEAR PEG 412. COLLECTED BY MR. W. H. FERGUSON. NOS. 1618-1635.

These are quite indeterminate.

FROM THE RAILWAY CUTTING, BETWEEN GOLDSBOROUGH AND BEALIBA. COLLECTED BY MR. W. H. FERGUSON. NOS. 1638-1675.

Clonograptus sp. Nos. 1639, 1640 (?), 1641 (?), 1646 (?), 1647 (?), 1651, 1653, 1658 (?), 1659 (?), 1663, 1665 (?), 1666 (?), 1669, 1675.

C. cf. *rigidus.* Nos. 1638, 1649, 1661, 1673.

The remainder are indeterminate. The whole collection is badly preserved, but probably indicates Lancefieldian beds.

FROM POSEIDON RUSH, S.-E. CORNER OF ALLOT. 14A, PARISH OF TARNAGULLA. COLLECTED BY MR. A. M. HOWITT. NO. 1637.

This appears to be a Dicellograptid, and, if so, is peculiar as showing the presence of Upper Ordovician rocks. More evidence is, however, required.

FROM 1½ MILES W. OF POSEIDON TOWNSHIP. COLLECTED BY MR. W. H. FERGUSON. NOS. 2470-2472.

These imperfect specimens, though clearly graptolites, are not capable of determination. They seem, however, to belong to a low horizon in the Lower Ordovician.

FROM 17 CHAINS E. 38° S. OF N.-W. CORNER OF ALLOT. 2, PARISH OF WAREEK. COLLECTED BY MR. A. M. HOWITT. NOS. 1811-1872.

Clonograptus gracilis, J. Hall. Nos. 1812, 1814, 1815, 1826, 1854.

C. rigidus, J. Hall. Nos. 1829 (?), 1847 (?), 1855 (?).

C. rigidus, var. *tenellus*, Linnars. Nos. 1813, 1816, 1823, 1858.

C. spp. indet. Nos. 1819, 1820 (?), 1822 (?), 1824, 1832, 1833, 1834, 1841, 1845, 1849, 1853, 1864, 1867 (?), 1868, 1869 (?), 1872.

Bryograptus sp. Nos. 1823 (?), 1846, 1861 (?), 1870 (?).

Dichograptus sp. No. 1851.

Tetragraptus decipiens, T. S. Hall. Nos. 1811, 1817, 1823, 1825, 1828, 1831, 1836, 1837, 1842, 1847, 1850, 1852, 1866.

Leptograptus antiquus, T. S. Hall. No. 1830 (?).

The remaining seventeen slabs contain nothing determinate. I think that No. 1846 is *B. victoriæ*, but the specimen is not clean enough. No. 1830, doubtfully referred to *L. antiquus*, is only a fragment, but I think the reference is correct. The bright, brick-red colour of the rocks, and their hardness, reminds one very strongly of those of Bendigo, but the fossils show them to be Lancefieldian, and, as far as can be judged at present, on the same horizon as those of the type section.

FROM ALLOT. 2, PARISH OF WAREEK, 3 CHAINS N. OF ABOVE LOCALITY. COLLECTED BY MR. A. M. HOWITT. NOS. 2325, 2327-2369.

Bryograptus sp. Nos. 2341, 2348 (counterparts).

B. victoriæ, T. S. Hall. No. 2353.

Clonograptus sp. Nos. 2328, 2336, 2337, 2341, 2348, 2356, 2357, 2358, 2366, 2368, 2369.

C. cf. *magnificus*, Pritchard. Nos. 2333, 2347 (counterparts), 2353.

C. cf. *flexilis*, J. Hall. Nos. 2333, 2365.

C. cf. *rigidus* var. *tenellus*, Linnarson. No. 2355.

Tetragraptus decipiens, T. S. Hall. Nos. 2342, 2343, 2346, 2350, 2352, 2359, 2360 (?), 2362, 2363.

The remainder are indeterminate.

The horizon is Lancefieldian. The rocks are bright red in colour, and very hard. The specimens are poorly preserved, and it is almost impossible to clear them.

From Bendigo.

Garden Gully Line, 10 chains N. of Spring Gully Reservoir. Collected by Mr. S. Waters. Nos. 1485-1502.

All the slabs contain specimens of *Tetragraptus fruticosus,* excepting No. 1491, which shows *T. bryonoides.* The only other species present which can be identified is *Phyllograptus typus,* which is very common.

The beds are typical Bendigonian.

(*b*) *Carshalton Line, Lansell's and Mundy's Shaft.. Collected by Mr. S. Waters. Nos.* 1503-1518.

Clonograptus magnificus, Pritchard, is apparently present on Nos. 1503 and 1518 (counterparts).

Goniograptus thureaui, McCoy. No. 1510.

Tetragraptus serra. No. 1504.

Most of the other slabs bear *T. fruticosus,* and a few show *Phyllograptus* sp.

The beds are Bendigonian, and probably *Clonograptus magnificus* is indicative of a low horizon in the series.

(*c*) *New Chum Line, Windmill Hill. Collected by Mr. H. S. Whitelaw. Nos.* 1519-1538.

Goniograptus macer. No. 1533.

G. thureaui. Nos. 1519 (?), 1521, 1523, 1525, 1526, 1533, 1534.

Dichograptus octobrachiatus. Nos. 1520, 1527, 1530, 1533.

Tetragraptus bryonoides. No. 1525.

T. fruticosus. Nos. 1522, 1524, 1525, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1535, 1536, 1537, 1538.

T. pendens. Nos. 1519, 1527.

Didymograptus extensus. Nos. 1521, 1525 (counterparts).

All the species are typically Bendigonian.

From Daylesford. Collected by Mr. W. Forbes. No. 1636.

Phyllograptus sp. and *Tetragraptus*?

From Daylesford.

(*a*) *Jim Crow Creek, W. of Hepburn. Collected by Mr. W. Baragwanath, sen.* Nos. 1676-1679.

Tetragraptus fruticosus. Nos. 1676, 1679.

T. pendens. 1676.

Phyllograptus typus. No. 1676.

Didymograptus bifidus. No. 1678.

D. caduceus. No. 1678.

D. extensus. No. 1678.

No. 1677 is indeterminate.

Probably the extreme upper limit of the Bendigonian.

(*b*) *Near Junction of Spring Creek with Jim Crow Creek. Collected by Mr. W. Baragwanath, sen.* Nos. 1680-1683.

Tetragraptus fruticosus. Nos. 1680, 1681, 1683.
T. pendens. Nos. 1680, 1683.
Phyllograptus typus. Nos. 1681, 1682, 1683.
Bendigonian.

(*c*) *Jim Crow Creek,* 18 *chains N.W. of Bryce's Bridge. Collected by Mr. W. Baragwanath, sen.* Nos. 1684-1688.

Tetragraptus fruticosus. Nos. 1684, 1685, 1687, 1688.
T. pendens. No. 1688.
Phyllograptus typus. Nos. 1684 (?), 1687.
Bendigonian.

(*d*) *Near Hard Hills Mineral Spring, Wombat Creek.*

Didymograptus cf. *extensus.* No. 1689.
No. 1690 is indeterminate.

(*e*) *Spring Creek, N. of Hepburn. Collected by Mr. W. Baragwanath, sen. Nos. 1690* (*bis*) *1694.*

Tetragraptus fruticosus. Nos. 1690 (*bis*) and 1693 (counterparts).
Phyllograptus typus. No. 1694.
Nos. 1691 and 1692 are indeterminate.
Bendigonian.

(*f*) *From near Wheelbarrow Point, Spring Gully. Collected by Mr. W. Baragwanath.*

Nos. 1697, 1698.

Didymograptus murchisoni. No. 1698.
No. 1697 is indeterminate.
Probably lowest of the Castlemaine series.

(*g*) *Smith's Creek, nearly opposite the Victoria Mine. No.* 1699.

Tetragraptus fruticosus and *T. bryonoides.*
Bendigonian.

(*h*) *From N. of Hepburn, on Spring Creek. Nos.* 1700-1707.

Tetragraptus bryonoides. Nos. 1705, 1707.
Phyllograptus typus. Nos. 1701 (?), 1705, 1706, 1707.
Didymograptus extensus. Nos. 1703, 1704.
D. bifidus. No. 1707.
Probably lowest of the Castlemaine series.

(*i*) *From the Junction of Jim Crow Creek and Spring Creek.*

Nos. 1708-1713.

Tetragraptus fruticosus. Nos. 1709, 1710, 1711.
Phyllograptus typus. Nos. 1708, 1709, 1711.
The others are indeterminate.
Bendigonian.

(*j*) *From Jim Crow Creek, W. of Hepburn. Nos.* 1714-1721.

Tetragraptus fruticosus. Nos. 1714, 1715, 1716, 1717, 1718, 1719, 1720, 1721.
T. serra. No. 1721.
Phyllograptus typus. Nos. 1714, 1715, 1716, 1719, 1721.
Didymograptus nitidus. No. 1714.
D. extensus, No. 1720.
D. bifidus. No. 1719.
Bendigonian.

(*k*) *From Spring Creek, where it crosses the main road near its junction with Jim Crow Creek, Parish of Franklin.* Nos. 1722-1725.

Didymograptus caduceus. Nos. 1722, 1724, 1725.
Indeterminate, No. 1723.
Castlemanian.

(*l*) 11.40 *chains from E. side of Allot.* 2, *Sec.* 8, *Parish of Franklin.*

Phyllograptus typus and *Didymograptus bifidus.* No. 1726.
Probably lowest of Castlemaine series.

(*m*) *Junction of Jim Crow and Spring Creeks.* Nos. 1727-1739.

Goniograptus macer. No. 1730.
Tetragraptus fruticosus. Nos. 1727, 1729, 1730, 1732, 1733.
T. serra. No. 1732.
T. quadribrachiatus. No. 1737.
Phyllograptus typus. Nos. 1728, 1730, 1731 (?), 1734.
Didymograptus caduceus. Nos. 1735, 1737, 1739.
Indeterminate, No. 1736, 1738.

There is evidently a confusion of the fossils of two horizons here, and if they have all come from near the same spot, careful collecting should reveal the fact.

The Bendigo and Castlemaine series are represented.

(*n*) *From Spring Creek, Franklin.* Nos. 1740-1744.

Didymograptus caduceus. Nos. 1740, 1741, 1742.
Indeterminate. Nos. 1743, 1744.
Castlemanian.

(*o*) 11.40 *chains from E. side of allot.* 2., *Sec.* 8, *Parish of Franklin.* Nos. 1745-1757.

Didymograptus bifidus. Nos. 1752, 1754, 1757.
Tetragraptus serra. No. 1754.
The remaining graptolites are indeterminate.

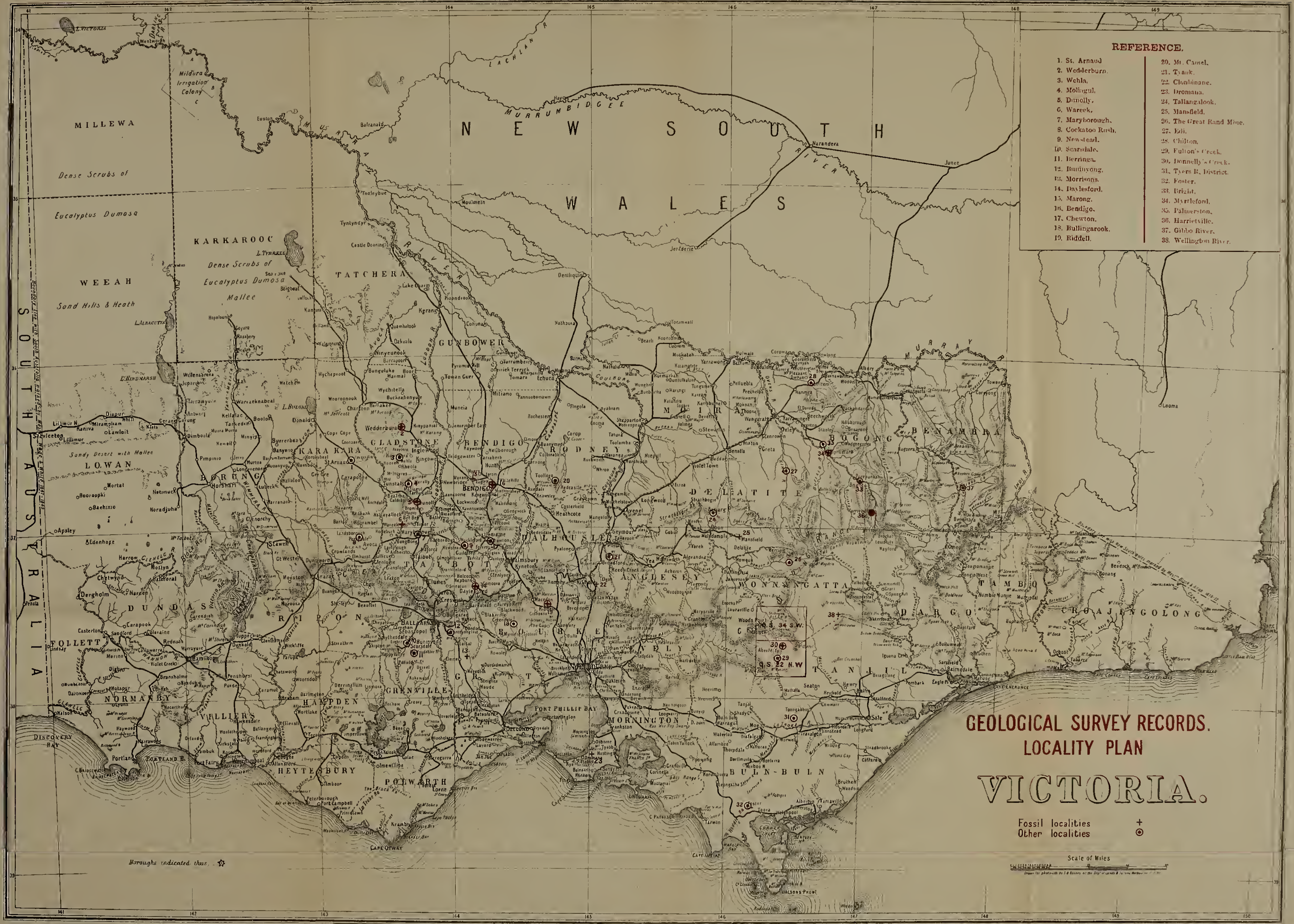
FROM THE WERRIBEE GORGE. No. 1758.

Indeterminate.

FROM DOLLY'S CREEK, 3 MILES N. E. OF ELAINE. COLLECTED BY MR. A. M. HOWITT. NOS. 1759-1810.

Dendrograptus sp. Nos. 1776 (?), 1794 (?).
Teragraptus fruticosus. Nos. 1763, 1804.
T. pendens. Nos. 1785, 1795.
T. bryonoides. Nos. 1760, 1763, 1766, 1767, 1772, 1776, 1777, 1780, 1781, 1782, 1796, 1805.
T. serra. Nos. 1761, 1762, 1771, 1784, 1785, 1788, 1793, 1796, 1798, 1808.
T. quadribrachiatus. Nos. 1784, 1791, 1792.
Phyllograptus typus. Nos. 1760, 1762 (?), 1763, 1765, 1768, 1770, 1773, 1774, 1776 (?), 1778, 1779, 1780, 1784, 1790, 1796, 1798, 1799, 1800, 1807, 1810.
Didymograptus bifidus. Nos. 1759, 1763, 1764, 1769, 1770, 1774, 1786, 1797, 1803, 1804, 1806, 1809.
D. nitidus. No. 1794.
D. extensus. No. 1800.
Indeterminate. Nos. 1775, 1783, 1789, 1801, 1802.

The beds belong to the highest of the Bendigonian series. In general appearance, colour, and texture, the beds resemble almost exactly those of the South Wattle Gully shaft at Chewton, which form the base of the Castlemaine series.


GEOLOGICAL SURVEY RECORDS.
LOCALITY PLAN
VICTORIA.
Fossil localities +
Other localities ⊙
Scale of Miles
Boroughs indicated thus
REFERENCE.
1. St. Arnaud
2. Wedderburn.
3. Wehla.
4. Moliagul.
5. Dunolly.
6. Wareek.
7. Maryborough.
8. Cockatoo Rush.
9. Newstead.
10. Scarsdale.
11. Berringa.
12. Buninyong.
13. Morrisons.
14. Daylesford.
15. Marong.
16. Bendigo.
17. Chewton.
18. Bullingarook.
19. Riddell.
20. Mt. Camel.
21. Tyaak.
22. Clonbinane.
23. Dromana.
24. Tallangalook.
25. Mansfield.
26. The Great Rand Mine.
27. Eli.
28. Chiltern.
29. Fulton's Creek.
30. Donnelly's Creek.
31. Tyers R. District.
32. Foster.
33. Bright.
34. Myrtleford.
35. Palmerston.
36. Harrietville.
37. Gibbo River.
38. Wellington River.
NEW SOUTH WALES
SOUTH AUSTRALIA
MURRUMBIDGEE
MURRAY R.
LACHLAN R.
MILLEWA
WEEAH
KARKAROOC
LOWAN
TATCHERA
GUNBOWER
KARA KARA
GLADSTONE
BENDIGO
RODNEY
MOIRA
BOGONG
BENAMBRA
DELATITE
BORUNG
DUNDAS
FOLLETT
NORMANBY
VILLIERS
HEYTESBURY
HAMPDEN
GRENVILLE
POLWARTH
RIPON
TALBOT
DALHOUSIE
ANGLESEY
WONNANGATTA
TAMBO
DARGO
CROAJINGOLONG
TANJIL
MORNINGTON
BULN-BULN
EVELYN
BOURKE
GRANT
PORT PHILLIP BAY
Mildura Irrigation Colony
Dense Scrubs of Eucalyptus Dumosa
Dense Scrubs of Eucalyptus Dumosa Mallee
Sand Hills & Heath
Sandy Desert with Mallee
Q.S. 34 S.W.
Q.S. 32 N.W.
L. VICTORIA
L. TYRRELL
L. HINDMARSH
L. ALBACUTYA
DISCOVERY BAY
PORTLAND B.
CAPE OTWAY
WILSONS PROM.
Wentworth
Euston
Balranald
Narandera
Junee
Jerilderie
Deniliquin
Mildura
Horsham
Hamilton
Portland
Warrnambool
Ballarat
Bendigo
Geelong
Melbourne
Echuca
Benalla
Wangaratta
Albury
Sale
Seymour
Mansfield
Casterton
Stawell
Ararat
Maryborough
Castlemaine
Kyneton
Lorne
Colac

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